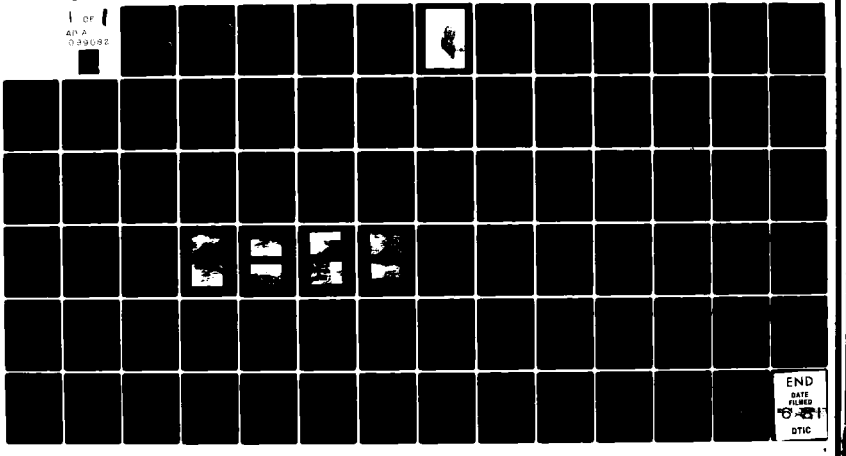
AD-A099 082 BAKER (MICHAEL) JR INC BEAVER PA F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. FULLER'S LAKE DAM (NDI NUMBER --ETC(U)
FEB 81 J A DZIUBEK DACW31-81-C-0011
UNCLASSIFIED NL



SUSQUEHANNA RIVER BASIN

SALT LICK CREEK, SUSQUEHANNA COUNTY

PENNSYLVANIA

FULLER'S LAKE DAM

NDI No. PA 00073

PennDER No. 58-121

Dam Owner: Frederick Hoal

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

DACW31-81-C-0011

prepared for

DEPARTMENT OF THE ARMY

Baltimore District, Corps of Engineers

Baltimore, Maryland 21203

prepared by

MICHAEL BAKER, JR., INC.

Consulting Engineers

4301 Dutch Ridge Road

Beaver, Pennsylvania 15009

February 1981

SUSQUEHANNA RIVER BASIN

FULLER'S LAKE DAM
SUSQUEHANNA COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00073
PennDER No. 58-121

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by: MICHAEL BAKER, JR., INC.
Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

Feb[redacted]81

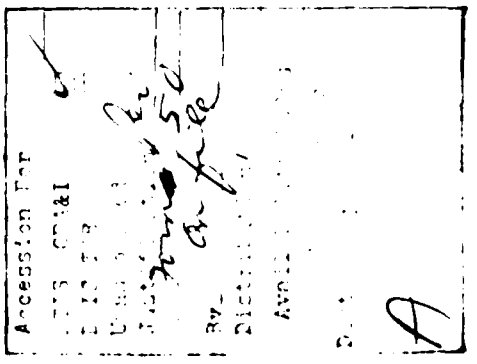
PREFACE

This report is prepared under guidance contained in the "Recommended Guidelines for Safety Inspection of Dams," for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Fuller's Lake Dam, Susquehanna County, Pennsylvania
NDI No. PA 00073, PennDER No. 58-121
Salt Lick Creek
Inspected 27 October 1980

ASSESSMENT OF GENERAL CONDITIONS

Fuller's Lake Dam is owned by Mr. Frederick Hoal and is classified as a "Significant" hazard - "Small" size dam. The dam was found to be in poor overall condition at the time of inspection.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District, Corps of Engineers, for Phase I Inspection Reports, revealed that the spillway will not pass the 100-year flood without overtopping the dam. A spillway design flood (SDF) in the range of the 100-year flood to the 1/2 Probable Maximum Flood (1/2 PMF) is required for Fuller's Lake Dam. Because the dam is on the low end of the "Small" size category in terms of storage capacity, the 100-year flood was chosen as the SDF. During the inspection, a beaver dam was blocking the entrance to the spillway. The hydraulic/ hydrologic evaluations performed analyzed the spillway with the beaver dam in place and removed. When the beaver dam is in place, the dam is overtopped by the 100-year flood by a maximum depth of 1.31 feet for a total duration of 3.33 hours. Analysis of the spillway without the beaver dam revealed that the dam would be overtopped by a maximum depth of 0.56 feet for a total duration of 1.67 hours by the 100-year flood. The spillway is therefore considered "Inadequate." It is recommended that the owner immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

Several items of remedial work should be immediately performed by the owner. Items 2 and 3 below should be completed by a qualified professional engineer experienced in the design and construction of earth dams. These include:

1) Remove the beaver dam from the spillway.

2) Immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

3) Monitor at regular intervals and during periods of high reservoir levels the seep on the right side of the downstream face. It should be examined for turbidity and/or increases in flow. If turbidity or an increase in flow is observed, then corrective measures should be implemented.

4) Cut the vegetation in the discharge channel of the spillway.

5) Provide means to draw down reservoir during an emergency.

In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance and operation procedures and records be developed and implemented. An emergency drawdown plan should be developed in case emergency drawdown of the reservoir should become necessary. These should be included in a formal operations and maintenance manual for the dam.

Submitted by:

MICHAEL BAKER, JR., INC.

John A. Dziubek, P.E.
Engineering Manager-Geotechnical

Date: 19 February 1981

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
COL, Corps of Engineers
District Engineer
Date: 13 MAR 81

FULLER'S LAKE DAM

Overall View of Dam from Right Abutment

TABLE OF CONTENTS

APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
FULLER'S LAKE DAM
NDI. No. PA 00073, PennDER No. 58-121

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority - The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances - Fuller's Lake Dam is an earthfill embankment constructed atop an existing masonry earthfill dam. The embankment has a length of 143 feet and a height of 9 feet. The embankment has a crest width of 18 feet and side slopes of 0.5H:1V (Horizontal to Vertical) upstream and 4H:1V downstream.

The spillway is an earth-lined trapezoidal channel located on the left abutment. There are no outlet works for the dam.

b. Location - Fuller's Lake Dam is located on Salt Lick Creek, in Jackson Township, Susquehanna County, Pennsylvania. It is approximately 4.75 miles due east of the town of New Milford. The dam can be found on the Great Bend, Pennsylvania, USGS 7.5 minute topographic quadrangle. The coordinates of the dam are N 41° 53.3' and W 75° 37.8'.

c. Size Classification - The height of the dam is 9 feet. The reservoir volume at the top of the dam is 114 acre-feet. Therefore, this dam is in the "Small" size category.

d. Hazard Classification - Page's Lake is 5000 feet downstream and Purdy Dam is located an additional 1400 feet downstream of Fuller's Lake. Both dams are in the "Significant" hazard category. There are no areas between Fuller's and Page's Lake Dams which are likely to be damaged if Fuller's Lake Dam were to fail. However, the damage centers

downstream from both Page's Lake and Purdy Dam would be affected if Fuller's Lake Dam were to fail. Therefore, Fuller's Lake Dam is considered to be in the "Significant" hazard category.

e. Ownership - The dam and reservoir are owned by Mr. Frederick D. Hoal, RD #1 Box 31, Susquehanna, Pennsylvania 18847.

f. Purpose of Dam - The reservoir was originally created to provide water power, but it is now used for recreation and fire protection purposes.

g. Design and Construction History - According to available records, the dam was originally built sometime around 1870 for lumbering operations. The engineer or contractor is unknown. A permit was issued to Frederick D. Hoal for reconstruction of the dam in October of 1953. Construction work began in August of 1955; however, weather problems and contract disputes halted work later that year. Mr. Hoal has not to date completed the construction of the dam or spillway in accordance to the plans shown in the PennDER File 58-121.

h. Normal Operational Procedures - The lake is typically maintained at the spillway crest, Elevation, 1537.0 ft. M.S.L.

1.3 PERTINENT DATA

a. Drainage Area (square miles) - 0.95

b. Discharge at Dam Site (c.f.s.)

Maximum Flood -	225
Spillway Capacity - (at Pool El. 1539.6 ft. M.S.L.) -	370

c. Elevation (feet above Mean Sea Level [ft. M.S.L.])* -

Design Top of Dam -	Unknown
Minimum Top of Dam -	1539.6
Maximum Design Pool -	Unknown
Spillway Crest -	1537.0
Streambed at Toe of Dam -	1530.9
Maximum Tailwater of Record -	Unknown

*All elevations are referenced to the spillway crest, Elevation 1537.0 ft. M.S.L., estimated from the USGS 7.5 minute topographic quadrangle, Great Bend, Pennsylvania.

d. Reservoir (feet)

Length of Normal Pool (El. 1537.0 ft. M.S.L.) -	1450
Length of Maximum Pool (El. 1539.6 ft. M.S.L.) -	1475

e. Storage (acre-feet)

Top of Dam (El. 1539.6 ft. M.S.L.) -	114
Normal Pool (El. 1537.0 ft. M.S.L.) -	61

f. Reservoir Surface (acres) -

Top of Dam (El. 1539.6 ft. M.S.L.) -	24.5
Normal Pool (El. 1537.0 ft. M.S.L.) -	16.5

g. Dam -

Type - Earthfill embankment		
Total Length (feet) -		143
Height (feet) - Design -		15
Field -		9
Top Width (feet) -		18
Side Slopes - Upstream -	Design	2H:1V
	Field	0.5H:1V[1]
Downstream -	Design	2H:1V
	Field	4H:1V
Zoning -		None
Impervious Core -		None
Cut-off -		None
Drains -		None

h. Diversion and Regulating Tunnel - None

i. Spillway -

Type - Irregular earth-lined, trapezoidal channel	
Location - Left abutment	
Bottom Width (feet) -	12.0
Top Width (feet) -	67.0
Depth of Channel (feet) -	2.6
Crest Elevation (ft. M.S.L.) -	1537.0
Gates -	None
Downstream Channel - Earth-lined with vegetation	

j. Outlet Works - None

[1]Slope above reservoir level as measured in the field.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The information reviewed consisted of File No. 58-121 of the Pennsylvania Department of Environmental Resources (PennDER) and included the following information:

1) Dam Permit Application Report filed 8 July 1951 with the Pennsylvania Department of Forests and Waters, Water and Power Resources Board, by Frederick Hoal.

2) Specifications and Engineering plans for reconstruction of the dam. These were drawn by W. L. Lance, P.E., Consulting Engineer, Trucksville, Pennsylvania and dated 22 July 1953. Also included were revisions and additions to the plans by the same engineer, dated 11 September 1953. These plans were submitted to the Bureau of Dams, Department of Forests and Waters.

3) Various correspondence between the Department of Forests and Waters, the owner Frederick D. Hoal, and the Engineer, W. L. Lance, regarding clarifications and revisions of the dam reconstruction plans.

4) Copy of the permit (expiring 1 January 1956), issued 14 October 1953, by the Department of Forests and Waters, Water and Power Resources Board, to Frederick D. Hoal for reconstruction of the dam.

5) A letter, dated 27 December 1955, from Frederick D. Hoal, briefly explaining how adverse weather conditions and a contract dispute halted reconstruction of the dam shortly after work began in August of 1955. Mr. Hoal requested an extension on the expiration date of his permit.

6) Correspondence from the Water and Power Resources Board, acknowledging and granting the request to extend the permit's expiration date to 1 January 1957.

7) Correspondence in February and March of 1958 between the Water and Power Resource Board and Frederick Hoal, stating that the permit for reconstructing the dam is to be cancelled and reconstruction plans postponed.

8) The latest inspection report by PennDER performed on 24 August 1964. This report found the dam to be in good order with the exception of debris in the spillway approach, but post-inspection correspondence stated that this problem was corrected.

2.2 CONSTRUCTION

The original masonry earthfill dam was probably built in 1870. Both the contractor and engineer are unknown. Construction of the present dam was started in August of 1955 by Master's Construction Company, however, inclement weather and a contract dispute stopped all construction work. Since that time, no further construction work has been performed.

2.3 OPERATION

There are no formal records for operation of the dam and reservoir. The reservoir is typically maintained at the spillway crest and does not fluctuate much from the crest. The owner visits the dam at least once a week.

2.4 EVALUATION

a. Availability - The information used is readily available from PennDER's File No. 58-121.

b. Adequacy - The information available and the measurements and observations made during the visual inspection are adequate for a Phase I Inspection of this dam.

c. Validity - There is no reason at the present time to doubt the validity of the available engineering data.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - The dam and its appurtenant structures were found to be in poor overall condition at the time of inspection. No unusual weather conditions were experienced on the date of inspection, 27 October 1980. Noteworthy deficiencies observed during the visual inspection are described briefly in the following paragraphs. The complete visual inspection check list, field sketch, top of dam profile, and typical cross-section are presented in Appendix A.

b. Dam - Clear seepage was observed exiting the downstream slope at a rate of approximately 7.5 g.p.m. The vegetation and the erosion channel away from the seep indicated that the seepage has been occurring for a long period of time. The seep is located 8 feet vertically below the crest of the dam, at station 1+40 (see Field Sketch in Appendix A).

c. Appurtenant Structures - The spillway approach channel is blocked by a beaver dam approximately 1.5 feet high. The spillway discharge channel is clogged with a heavy growth of brush.

d. Reservoir Area - The reservoir slopes are moderate with a good cover of trees and brush. The average depth of the reservoir is approximately 4 feet. There are no indications that sedimentation has been a significant problem in the reservoir.

e. Downstream Channel - The downstream channel is moderately sloped and passes beneath 2 dirt township roads, 1000 and 2600 feet downstream of the dam. Page's Lake Dam (NDI No. PA 00062, PennDER No. 58-5) and Purdy (Stump Pond) Dam (NDI No. PA 00063, PennDER No. 58-11) are located downstream. Phase I Inspection Reports for these dams are currently being prepared by Michael Baker, Jr., Inc.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no formal procedures for lowering the reservoir or evacuating the downstream area in case of an impending dam failure. It is recommended that formal emergency procedures be adopted, prominently displayed, and furnished to all operating personnel.

4.2 MAINTENANCE OF THE DAM

There are no formal records of maintenance or formal procedures for evaluating the necessity of maintenance for the structure. It is recommended that formal inspection and maintenance procedures be developed.

4.3 MAINTENANCE OF OPERATING FACILITIES

There are no operating facilities installed at the dam. An emergency drawdown plan should be developed in case emergency drawdown of the reservoir should become necessary.

4.4 DESCRIPTION OF ANY WARNING SYSTEM

There are no warning procedures in the event of a dam failure. An emergency warning procedure should be developed.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

A formal maintenance and operations manual should be prepared for the dam.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data - No hydrologic or hydraulic design calculations are available for Fuller's Lake Dam.

b. Experience Data - The maximum depth of flow in the spillway was reported to have been 1.5 feet. This depth occurred during a storm in 1976 and corresponds to a flow of 225 c.f.s.

c. Visual Observations - A beaver dam, approximately 1.5 feet high, was located in the spillway. At the time of the inspection, this beaver dam had raised the water surface elevation approximately 1.0 feet above normal.

d. Overtopping Potential - Fuller's Lake Dam is a "Small" size - "Significant" hazard dam requiring evaluation for a spillway design flood (SDF) in the range of the 100-year flood to the 1/2 Probable Maximum Flood (1/2 PMF). Because the dam is at the low end of the "Small" size category in terms of storage capacity, the 100-year flood was chosen as the SDF.

Using material from "The Hydrologic Study - Tropical Storm Agnes," prepared by the Special Studies Branch, Planning Division, North Atlantic Division, Corps of Engineers, in New York City, December 1975, the peak inflow to the impoundment for the 100-year flood was calculated to be 1050.0 c.f.s.

The hydrologic characteristics of the basin, specifically, the Snyder's unit hydrograph parameters, were obtained from a regionalized analysis conducted by the Baltimore District of the U.S. Army Corps of Engineers. Using zero as an initial and constant loss rate, an inflow of only 910 c.f.s. was obtained for the 100-year flood; therefore, the SCS dimensionless unit hydrograph approach was used to obtain the 100-year flood hydrograph. The hydraulic capacity of the dam, reservoir, and spillway was assessed by utilizing the U.S. Army Corps of Engineers' Flood Hydrograph Package, HEC-1 DB.

Analysis of the dam and spillway with the beaver dam in place revealed that the dam would be overtopped by a maximum depth of 1.31 feet for a total

duration of 3.33 hours. Analysis of the dam and spillway without the beaver dam revealed that the dam would be overtopped by a maximum depth of 0.56 feet for a total duration of 1.67 hours.

e. Spillway Adequacy - As outlined in the above analyses, the spillway will not pass the SDF without overtopping the dam; therefore, the spillway is considered "Inadequate."

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - A clear seep (estimated flow rate 7.5 g.p.m.) was found on the right downstream face of the embankment. The owner reported that an old flume was located in the dam near this location. This old wooden flume may have decayed, leaving a potential seepage zone through the dam. It is recommended that the seepage be monitored at regular intervals and the quantity and turbidity of the seepage recorded. If an increase in either of these two items is occurring, then corrective measures are necessary.

b. Design and Construction Data - No design or construction data were available for review. Limited information on the dam foundation and materials is available. Because of the modest height of the dam and history of satisfactory performance of the slopes, no additional assessments of the stability are necessary for this Phase I Inspection Report. However, if increased amounts of seepage or other signs of distress which would affect the structural stability of the embankment are observed during future inspections, then corrective measures may become necessary.

c. Operating Records - No operating records are available.

d. Post-Construction Changes - The improper backfilling of the old wooden flume may be contributing to the seepage which was observed during the visual inspection.

e. Seismic Stability - The dam is located in Seismic Zone 1 of the "Seismic Zone Map of the Contiguous United States," Figure 1, page D-30, "Recommended Guidelines for Safety Inspection of Dams." This is a zone of minor seismic activity. Therefore, further consideration of the seismic stability is not warranted.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety - Fuller's Lake Dam was found to be in poor overall condition at the time of inspection. Fuller's Lake Dam is a "Significant" hazard - "Small" size dam requiring a spillway capacity in the range of the 100-year flood to the 1/2 PMF. Because the dam is on the low end of the "Small" size category, the 100-year flood was chosen as the SDF. As presented in Section 5, the spillway was analyzed for two different cases. One, with the beaver dam in place, showed that the dam would be overtopped by the 100-year flood for a maximum depth of 1.31 feet and a total duration of 3.33 hours. The second, with the beaver dam removed, showed that the dam would be overtopped by a maximum depth of 0.56 feet and total duration of 1.67 hours during the 100-year flood. Therefore, the spillway is considered "Inadequate."

b. Adequacy of Information - The information available and the observations made during the visual inspection are considered sufficient for this Phase I Inspection Report.

c. Urgency - The owner should immediately initiate the action discussed in paragraph 7.1.d.

d. Necessity for Additional Data/Evaluation - The hydraulic/hydrologic analysis performed in connection with this Phase I Inspection Report has indicated the need for additional spillway capacity. is recommended that the owner immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection revealed certain items of remedial work which should be immediately performed by the owner. Items 2 and 3 below should be completed by a qualified professional engineer experienced in the design and construction of earth dams. These include:

1) Remove the beaver dam from the spillway.

2) Immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

3) Monitor at regular intervals and during periods of high reservoir levels the seep on the right side of the downstream face. It should be examined for turbidity and/or increase in flow. If turbidity or an increase in flow is observed, then corrective measures should be implemented.

4) Cut the vegetation in the discharge channel of the spillway.

5) Provide means to draw down reservoir during an emergency.

In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operation procedures and records be developed and implemented. An emergency drawdown plan should be developed in case emergency drawdown of the reservoir should become necessary. These should be included in a formal maintenance and operations manual for the dam.

APPENDIX A

VISUAL INSPECTION CHECK LIST, FIELD SKETCH, TOP OF DAM PROFILE, AND TYPICAL CROSS-SECTION

Check List
Visual Inspection
Phase 1

Name of Dam Fuller's Lake Dam **County** Susquehanna **State** PA **Coordinates** Lat. N 41°53.3'

NDI # PA 00073
PennDER # 58-121

Long. W 75°37.8'

Date of Inspection 27 October 1980 **Weather** Sunny **Temperature** 45° F.

Pool Elevation at Time of Inspection 1538.02 ft. M.S.L. **Tailwater at Time of Inspection** 1536.89 ft. M.S.L.

Inspection Personnel:

Michael Baker, Jr., Inc.:

James G. Ulinski
Wayne D. Lasch
Jeffrey S. Maze

Owner's Representatives:

Mr. Frederick Hoal

James G. Ulinski **Recorder**

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: FULLER'S LAKE DAM

NDI # PA 00073

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS		
DRAINS		
WATER PASSAGES		
FOUNDATION		

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: FULLER'S LAKE DAM
NDI # PA 00073

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES		
STRUCTURAL CRACKING		
VERTICAL AND HORIZONTAL ALIGNMENT		
MONOLITH JOINTS		
CONSTRUCTION JOINTS		

EMBANKMENT

Name of Dam FULLER'S LAKE DAM

NDI # PA 00073

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed	

EMBANKMENT

Name of Dam FULLER'S LAKE DAM

NDI # PA 00073

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The embankment has not been constructed in accordance with plans. The crest of the dam slopes down towards the spillway channel at the left abutment.	
RIPRAP FAILURES	None observed	

EMBANKMENT

Name of Dam FULLER'S LAKE DAM

NDI # PA 00073

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good condition	
ANY NOTICEABLE SEEPAGE	Clear seepage was noted at Sta. 1+40 at a rate of 7.5 g.p.m. The owner reported that the seepage is in the vicinity of where an old flume was located. This flume is reported to be a part of the original dam which was used for lumbering operations.	The seepage should be periodically examined and the quantity and turbity recorded.
STAFF GAGE AND RECORDER	None observed	
DRAINS	None observed	

OUTLET WORKS

Name of Dam: FULLER'S LAKE DAM

NDI # PA 00073

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not Applicable	
INTAKE STRUCTURE	Intake structure as shown on the plans was not constructed.	
OUTLET STRUCTURE	Outlet structure as shown on the plans was not constructed.	
OUTLET CHANNEL	Not Applicable	
EMERGENCY GATE	Not Applicable	

UNGATED SPILLWAY

Name of Dam: FULLER'S LAKE DAM

NDI # PA 00073

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Concrete weir and spillway were never constructed as shown on the plans.	
APPROACH CHANNEL	Beaver dam is blocking the entrance to the approach channel.	Remove beaver dam.
DISCHARGE CHANNEL	The discharge channel is heavily vegetated.	The vegetation should be cut.
BRIDGE AND PIERS	None observed	

GATED SPILLWAY - Not Applicable

Name of Dam: FULLER'S LAKE DAM

NDI # PA 00073

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		

INSTRUMENTATION

Name of Dam: FULLER'S LAKE DAM

NDI # PA 00073

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed	
OBSERVATION WELLS	None observed	
WEIRS	None observed	
PIEZOMETERS	None observed	
OTHER		

RESERVOIR

Name of Dam: FULLER'S LAKE DAM

NDI # PA 00073

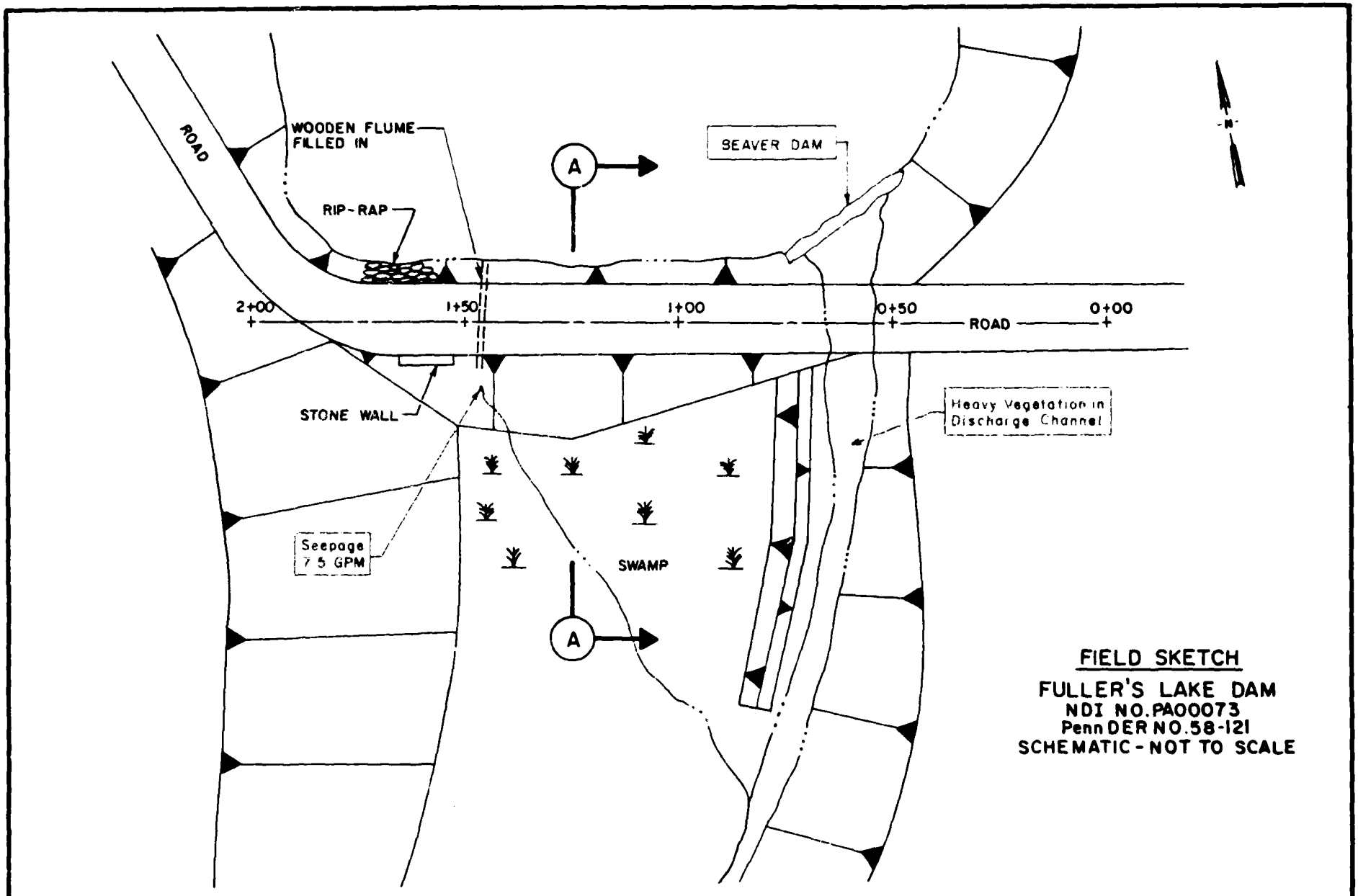
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderate slopes with good growth of ground cover and trees.	
SEDIMENTATION	The average depth of the reservoir is approximately 4 ft. There are no indications that sedimentation is a significant problem.	

DOWNSTREAM CHANNEL

Name of Dam: FULLER'S LAKE DAM

NDI # PA 00073

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel is heavily vegetated.	
SLOPES	The downstream channel slope is moderate to flat. The side slopes are gentle to moderate and heavily vegetated.	
APPROXIMATE NO. OF HOMES AND POPULATION	The downstream channel passes beneath two dirt township roads 1000 ft. and 2600 ft. downstream.	
DOWNSTREAM DAMS	Page's Lake Dam (NDI # PA 00062, PennDER # 58-5) and Purdy (Stump Pond) Dam (NDI # PA 00063, PennDER # 58-11) are located downstream. Phase I Inspection Reports for these dams are being prepared by Michael Baker, Jr., Inc.	



CROSS SECTION TAKEN AT STA. 1+25

FIELD SKETCH

FULLER'S LAKE DAM
NDI NO. PA00073
Penn DER NO. 58-121
SCHEMATIC - NOT TO SCALE

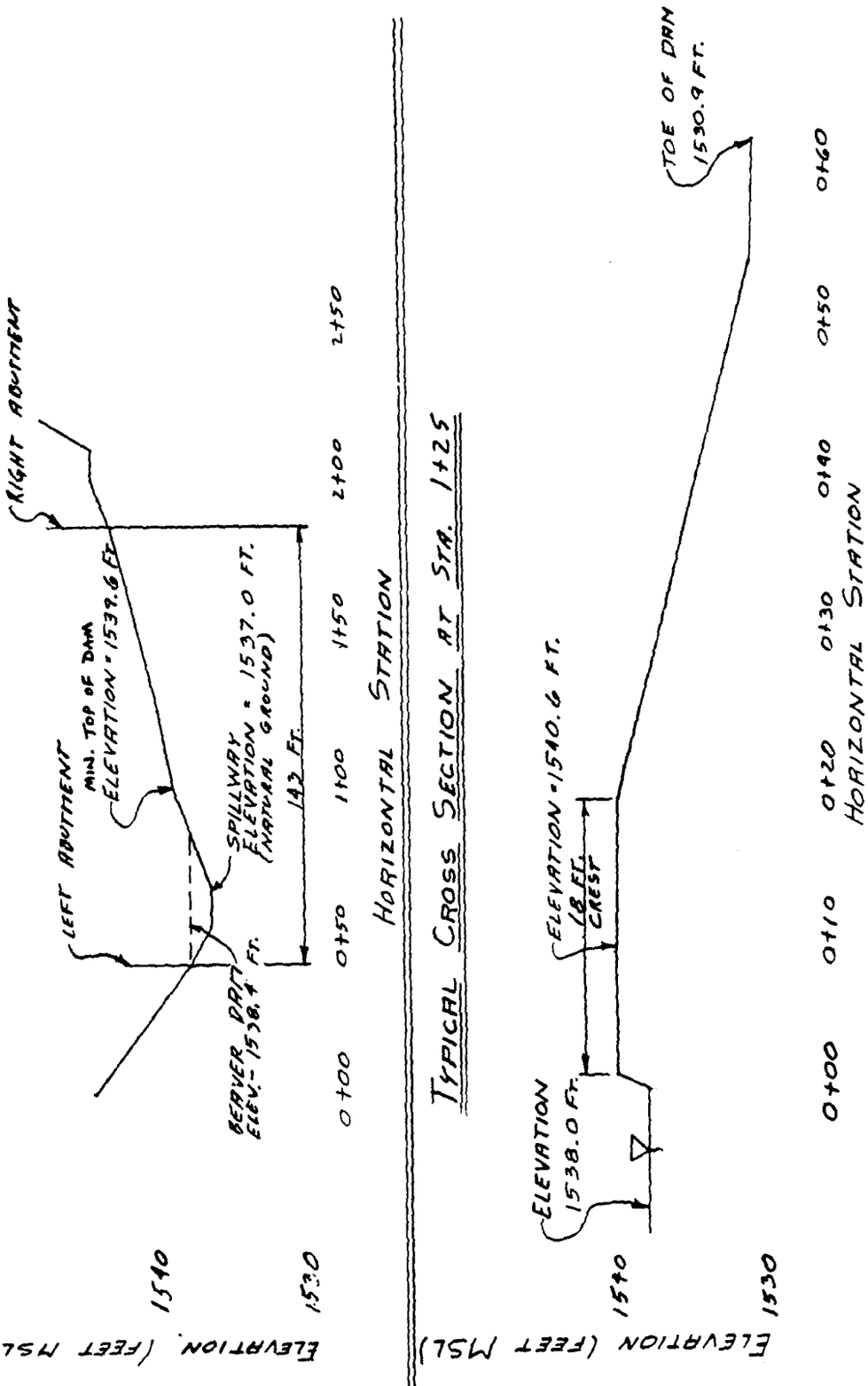
MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

FULLER'S LAKE DAM

TOP OF DAM PROFILE
TYPICAL CROSS-SECTION

DATE OF INSPECTION: 27 October 1980



APPENDIX B

ENGINEERING DATA CHECK LIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: FULLER'S LAKE DAM
NDI # PA 00073

ITEM	REMARKS
PLAN OF DAM	See Plate 4 of this report.
REGIONAL VICINITY MAP	The USGS 7.5 minute topographic quadrangle for Great Bend, Pennsylvania was used to prepare the vicinity map which is enclosed in this report as the Location Plan (Plate 1).
CONSTRUCTION HISTORY	The dam was probably built around 1870 to provide water power for a lumbering operation. No other information about construction on the dam is available until 1955 when Master's Construction Company began work to reconstruct the dam to specifications drawn by W.L. Lance, P.E., consulting engineer. The reconstruction work was never completed. No further information is available.
TYPICAL SECTIONS OF DAM	See Plate 3 of this report.
HYDROLOGIC/HYDRAULIC DATA	No information available
OUTLETS - PLAN	See Plate 3. Note outlet work was not constructed.
- DETAILS	See Plate 3
- CONSTRAINTS	No information available
- DISCHARGE RATINGS	No information available
RAINFALL/RESERVOIR RECORDS	None available

Name of Dam: FULLER'S LAKE DAM

NDI # PA 00073

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	No geology reports are available for the dam. See Appendix F for the regional geology
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	No design computations are available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available
POST-CONSTRUCTION SURVEYS OF DAM	No information available
BORROW SOURCES	No information available

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	In July 1951 the owner, Frederick Hoal, applied for a permit to reconstruct the dam. After engineering plans and drawings were submitted by Mr. W.L. Lance, consulting engineer, a permit was granted in October 1953 to rebuild the dam. Reconstruction work began on the dam in August of 1955 by the Masters Construction Company. Adverse weather and a contract dispute halted the work shortly thereafter and the reconstruction project never resumed.
HIGH POOL RECORDS	No information available
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	No detailed engineering report other than the reconstruction plans of W.L. Lance were available. However, Mr. Lance's plan was never fully implemented, therefore, no existing or "as-built" plans were available for inspection. The latest inspection report on the dam by the Division of Dams and Encroachments was on 24 August 1965 and is available in the PennDER file.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported in the information available.
MAINTENANCE OPERATION RECORDS	No formal maintenance records are kept.

Name of Dam: FULLER'S LAKE DAM

NDI # PA 00073

ITEM	REMARKS
SPILLWAY PLAN, SECTIONS, and DETAILS	No information available
OPERATING EQUIPMENT PLANS & DETAILS	No information available

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Size: 0.95 sq. mi., mild to steep slopes with wooded areas

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1537.0 ft. M.S.L. (61 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1539.6 ft. M.S.L. (114 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1539.6 ft. M.S.L. (minimum top of dam elevation)

SPILLWAY: Irregular trapezoidal earth channel

a. Crest Elevation 1537.0 ft. M.S.L.
b. Type Trapezoidal channel
c. Bottom Width 12 ft.
d. Top Width 67 ft.
e. Location Spillover Left abutment
f. Number and Type of Gates None

OUTLET WORKS: None

a. Type
b. Location
c. Entrance Inverts
d. Exit Inverts
e. Emergency Drawdown Facilities

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE Unknown

APPENDIX C

PHOTOGRAPH LOCATION PLAN AND PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View - Overall View of Dam from Right Abutment

Photograph Location Plan

Photo 1 - View of Crest of Dam from Right Abutment

Photo 2 - View of Crest of Dam from Left Abutment

Photo 3 - View of Upstream Face of Dam from Left Abutment

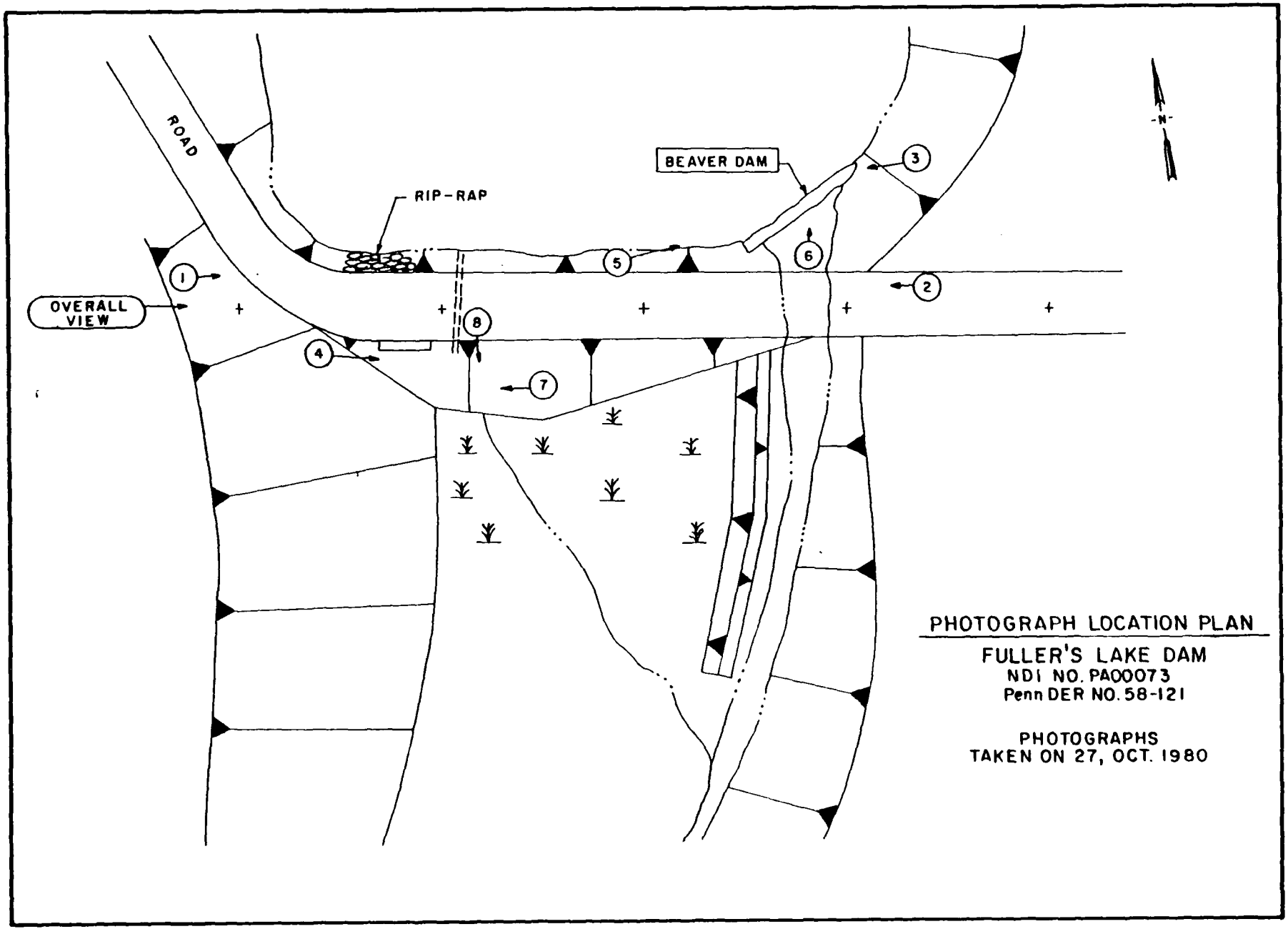
Photo 4 - View of Downstream Face of Dam from Right Abutment

Photo 5 - View of Entrance to Spillway (Note Beaver Dam at Entrance to Spillway)

Photo 6 - Close-up View of Beaver Dam at Entrance to Spillway

Photo 7 - View of Location of Seepage (Note Plush Vegetation at Lower Left of Photo)

Photo 8 - View Looking Downstream of Seepage Location (Lower Right) and Flow



PHOTOGRAPH LOCATION PLAN

FULLER'S LAKE DAM
NDI NO. PA00073
Penn DER NO. 58-121

PHOTOGRAPHS
TAKEN ON 27, OCT. 1980

FULLER'S LAKE DAM

PHOTO 1. View of Crest of Dam from Right Abutment

PHOTO 2. View of Crest of Dam from Left Abutment

PHOTO 3. View of Upstream Face of Dam from Left Abutment

PHOTO 4. View of Downstream Face of Dam from Right Abutment

PHOTO 5. View of Entrance to Spillway
(Note Beaver Dam at Entrance to Spillway)

PHOTO 6. Close-up View of Beaver Dam at Entrance to Spillway

FULLER'S LAKE DAM

PHOTO 7. View of Location of Seepage
(Note Plush Vegetation at Lower Left of Photo)

PHOTO 8. View Looking Downstream of Seepage Location (Lower Right) and Flow

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS
Box 280
Beaver, Pa. 15009

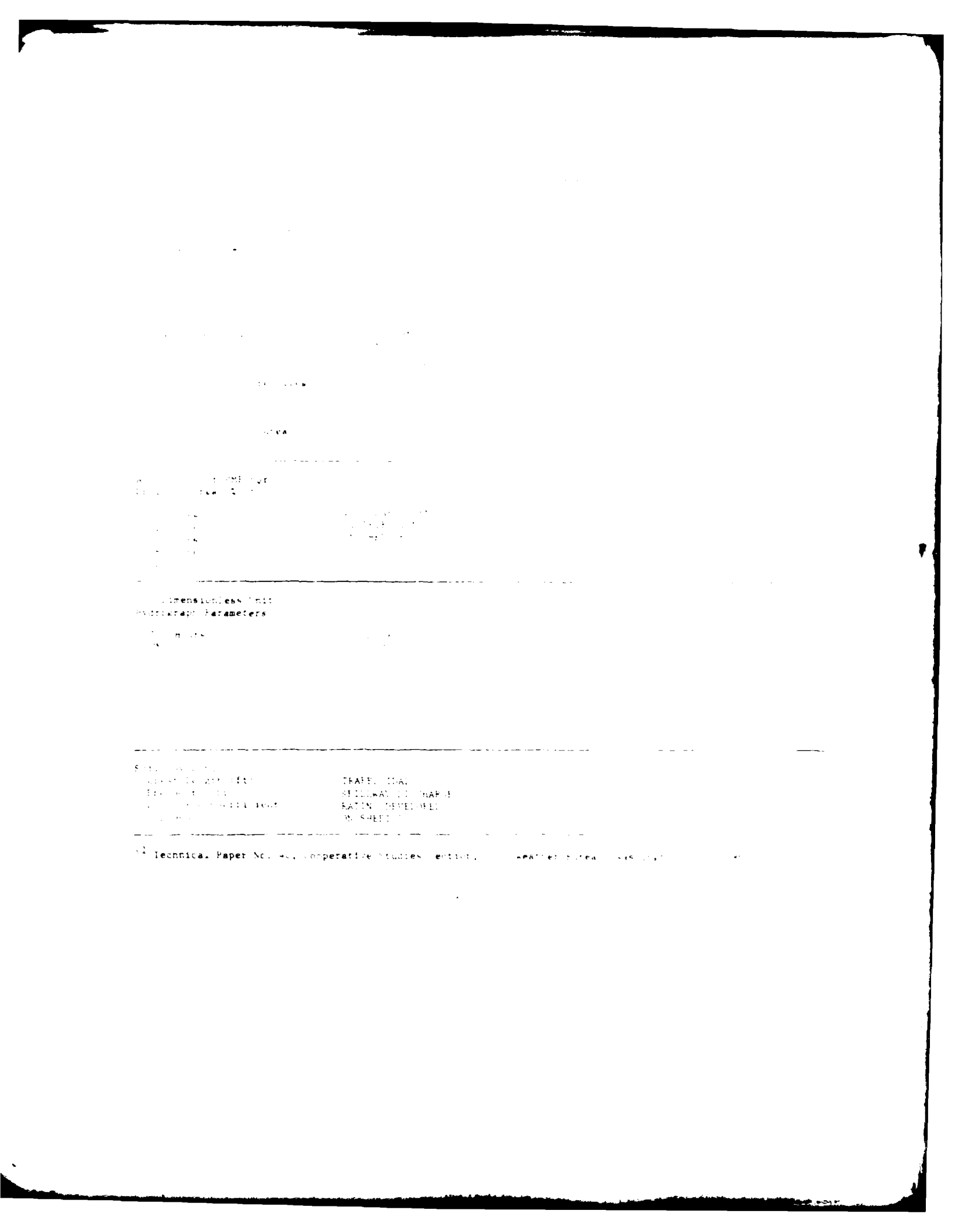
Subject FOWLER LAKE DAM S.O. No
APPENDIX E - HYDROLOGIC AND Sheet No of
HYDRAULIC COMPUTATIONS Drawing No
Computed by Checked by Date

SUBJECT	PAGE

PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.



dimensionless unit
Hydrograph Parameters

TRAPEZOIDAL
RECTANGULAR TRIANGULAR
RATIO DEVELOPED
% SHEET

Technical Paper No. [illegible], Cooperative Studies [illegible], [illegible]

[illegible] CALCULATIONS

[illegible] [illegible] ELEVATION DATA [illegible] FROM SURVEY)

[illegible] SURFACE AREA (ACRES)

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] STORAGE

[illegible] $\frac{H}{3}$ $(A_1 + A_2 + \sqrt{A_1 A_2})$

[illegible] AVERAGE DEPTH = 4 FT

[illegible] AREA OF NORMAL POOL [illegible] 53 AC

[illegible] SURFACE AREA OF RESERVOIR BOTTOM = 3.88 AC

[illegible] FROM AVERAGE DEPTH AND

[illegible] SIDE SLOPES)

[illegible] STORAGE [illegible] (.53 + 3.88 + $\sqrt{(.53)(3.88)}$)

[illegible] 6[illegible].74 AC-FT

[illegible] STORAGE

[illegible]14 [illegible] HEC-1 ANALYSIS

[illegible] HYDROGRAPH PARAMETERS

[illegible] 45 [illegible] 61 [illegible]

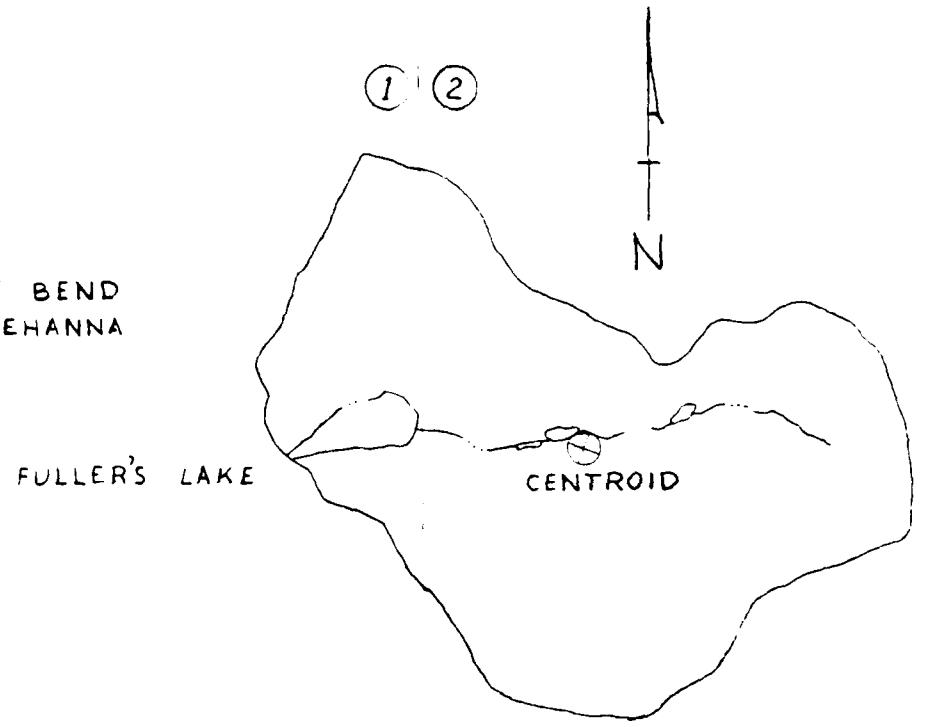
[illegible] ZONE [illegible]

[illegible]

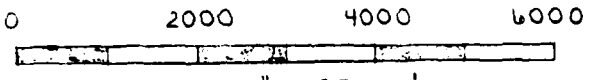
[illegible] 45

DRAINAGE AREA [illegible] 95 SQ MI.

QUADS:
1. GREAT BEND
2 SUSQUEHANNA



FULLER'S LAKE DAM:
DRAINAGE AREA AND
CENTROID MAP



SCALE : 1" = 2000'

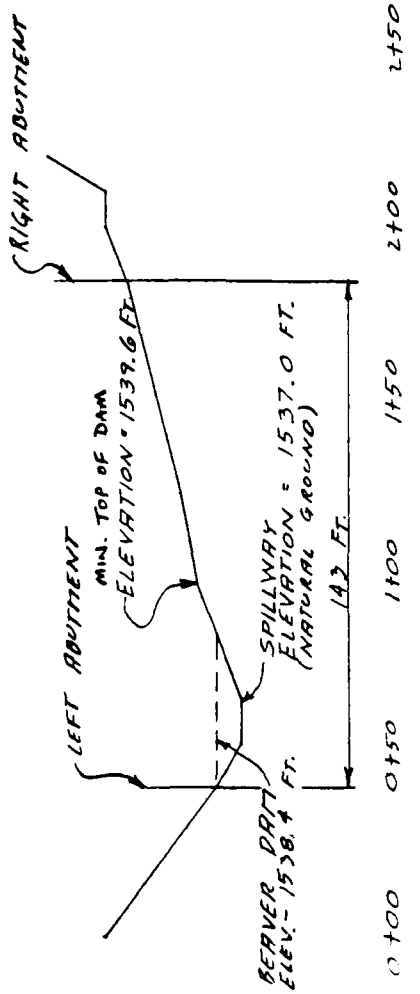
MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

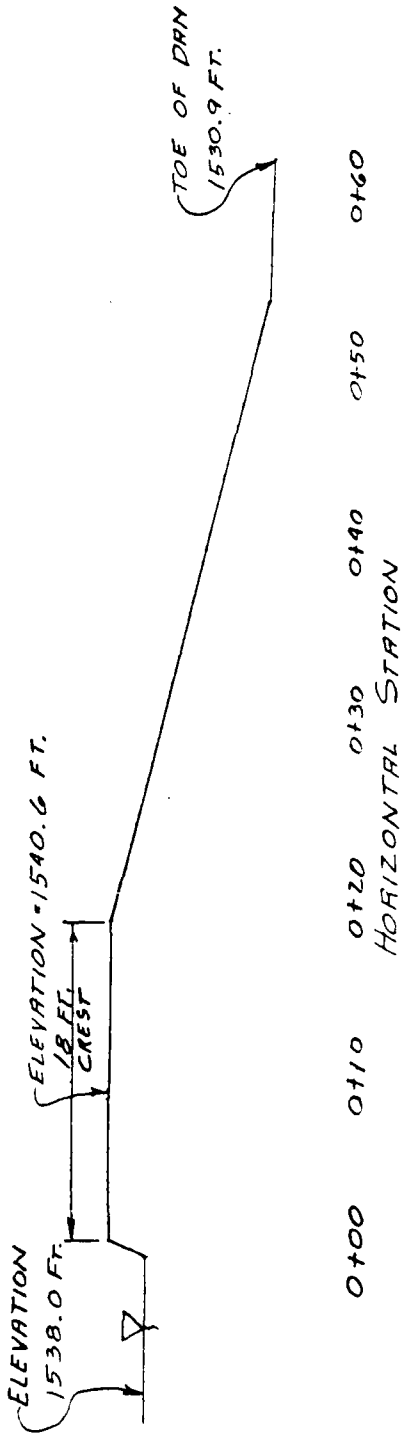
Subject FULLER'S LAKE DAM — S.O. No. 13837-00-AKA-07
TOP OF DAM PROFILE — Sheet No. 4 of 19
TYPICAL CROSS SECTION — Drawing No.
Computed by GWT — Checked by WAL — Date 11-17-80

TOP OF DAM PROFILE (LOOKING DOWNSTREAM):

LENGTH OF DAM = 143 FEET



TYPICAL CROSS SECTION AT STA. 1+25



MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS
Box 280
Beaver, Pa. 15009

Subject FULLER'S LAKE DAM S.O. No.
SPILLWAY DISCHARGE RATING Sheet No. 5 of 19
Drawing No.
Computed by GWT Checked by WDL Date 12-18-80

BEAVER DAM REMOVED

DEVELOP RATING CURVE BASED UPON CRITICAL FLOW OVER SPILLWAY:

$V = \sqrt{gD}$ (CHOW, OPEN CHANNEL HYDRAULICS, P. 43)

$g = 32.2$ FT/SEC^2

D = MEAN HYDRAULIC DEPTH = $\frac{\text{FLOW AREA}}{\text{FREE SURFACE TOPWIDTH}} = \frac{A}{T}$

V = MEAN FLOW VELOCITY

$Q = VA$

SPILLWAY ELEVATION, (FT)	FLOW DEPTH (FT)	AREA, (FT^2)	TOP WIDTH, (FT.)	A/T	V, (FT/SEC)	Q, (CFS)	$V^2/2g$	RESERVOIR SURFACE, (FT)
1537.0	0	0	12.0	0	0	0	0	1537.00
1537.5	0.5	8.25	21.0	.3929	3.56	29.37	0.20	1537.70
1538.0	1.0	21.75	33.0	.6591	4.61	100.27	0.32	1538.33
1538.5	1.5	41.00	44.0	.9318	5.48	224.68	0.47	1538.97
1539.0	2.0	61.50	54.5	1.128	6.03	370.85	0.56	1539.56
1539.5	2.5	93.50	65.0	1.438	6.80	635.80	0.72	1540.22
1539.6	2.6	97.70	67.0	1.458	6.90	674.13	0.74	1540.34

BEAVER DAM IN SPILLWAY

SPILLWAY RATING

BROAD-CRESTED WEIR

$C = 2.9$ $Q = CLH^{3/2}$

$L = 44$ FT.

CREST ELEVATION - 1538.4 FT.

TOP OF BEAVER DAM STORAGE (ELEV. - 1538.5 FT.)

89 AC.-FT. (FROM HEC-1 ANALYSIS)

NORMAL POOL STORAGE (ELEV. - 1539.6 FT)

114 AC.-FT. (FROM HEC-1 ANALYSIS)

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

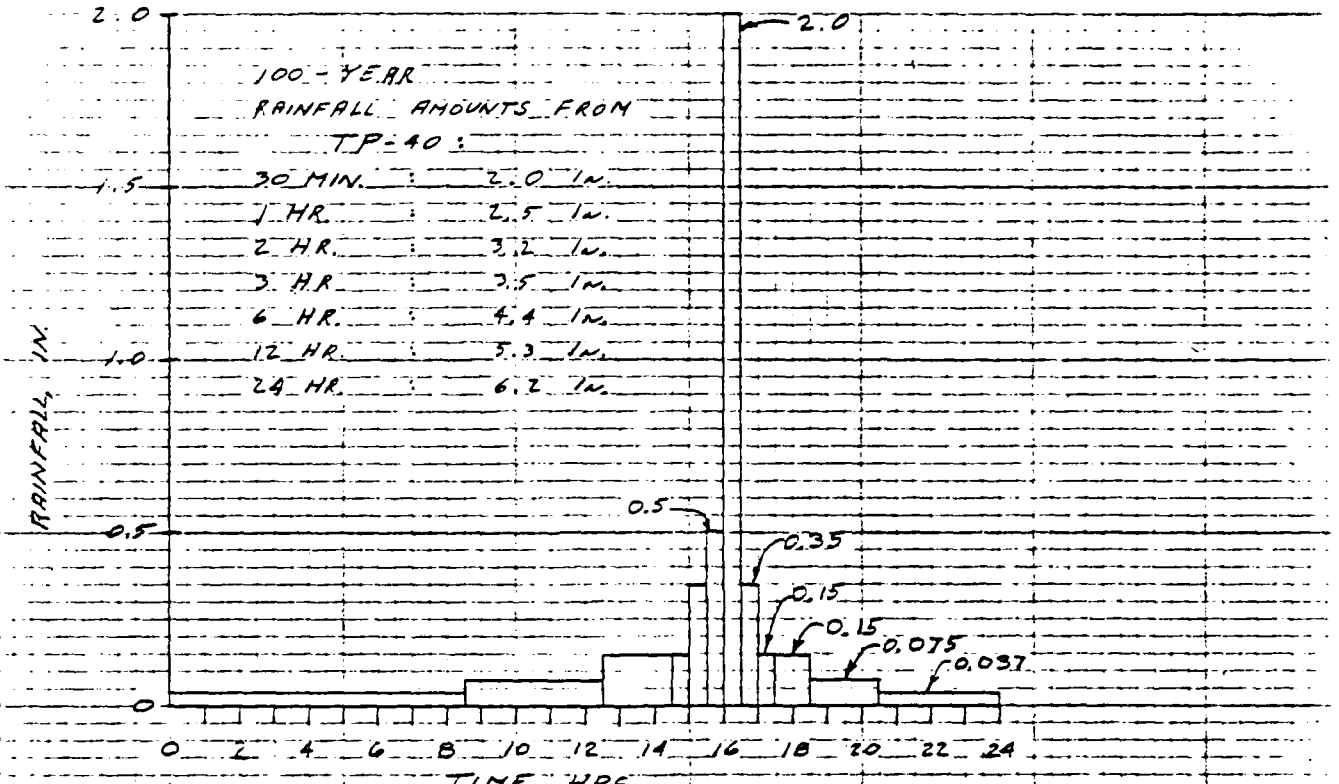
Box 280
Beaver, Pa. 15009

Subject FULLER'S LAKE DAM S.O. No.

100-YEAR STORM DISTRIBUTION Sheet No. 6 of 19

Drawing No.

Computed by GWT Checked by WDL Date 11-25-80



RAINFALL DISTRIBUTION
(30 MINUTE INTERVALS)

INTERVAL NUMBERS	% TOTAL RF OCCURRING IN EACH INTERVAL
1 - 17	0.6
18 - 25	1.2
26 - 29	2.4
30	2.5
31	5.7
	8.1 TOTAL = 100%
33	32.3
34	5.7
35	2.5
36 - 37	2.4
38 - 41	1.2
42 - 48	0.6

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS
Box 280
Beaver, Pa. 15009

Subject FULLER'S LAKE DAM — S.O. No.
100-YEAR DISCHARGE — Sheet No. 7 of 19
CALCULATION — Drawing No.
Computed by GWT — Checked by WDL — Date 12-19-80

THE INFLOW TO THE IMPOUNDMENT FOR THE 100-YEAR FLOOD WAS CALCULATED USING MATERIAL FROM "THE HYDROLOGIC STUDY - TROPICAL STORM AGNES" PREPARED BY THE SPECIAL STUDIES BRANCH, PLANNING DIVISION, NORTH ATLANTIC DIVISION, CORPS OF ENGINEERS, IN NEW YORK CITY.

DRAINAGE AREA = 0.95 SQ. MI.

① COMPUTE THE MEAN LOGARITHM

$$\log(Q_m) = C_m + 0.75 \log A$$

$\log(Q_m)$ = MEAN LOGARITHM OF ANNUAL FLOOD PEAKS.
A = DRAINAGE AREA, SQ. MI. = 0.95 SQ. MI.
C_m = MAP COEFFICIENT FOR MEAN LOG OF ANNUAL PEAKS FROM FIG. 21 = 2.16

$$\log(Q_m) = 2.16 + 0.75(\log 0.95)$$
$$= 2.1433$$

② COMPUTE STANDARD DEVIATION

$$S = C_s - 0.05(\log A)$$

S = STANDARD DEVIATION OF THE LOGARITHMS OF THE ANNUAL PEAKS.
C_s = MAP COEFFICIENT FOR STANDARD DEVIATION FROM FIG. 22 = 0.35
A = DRAINAGE AREA, SQ. MI. = 0.95 SQ MI.

$$S = 0.35 - 0.05(\log 0.95)$$
$$= 0.3511$$

③ SELECT SKEW COEFFICIENT FROM FIG. 23 = 0.23

④ $\log(Q_{100}) = \log(Q_m) + K(P,g)S$

$K(P,g)$ = STANDARD DEVIATE FOR A GIVEN EXCEEDENCE FREQUENCY PERCENTAGE (P) AND SKEW COEFFICIENT (g) FROM EXHIBIT 39 OF BEARD'S "STATISTICAL METHODS IN HYDROLOGY" = 2.501

$$\log(Q_{100}) = 2.1433 + 2.501(0.3511)$$
$$= 3.0214$$
$$Q_{100} = 1050 \text{ CFS}$$

USING ZERO LOSS RATES, A PEAK FLOW OF 906 CFS. WAS OBTAINED IN THE HEC-1 ANALYSIS IF THE SNYDER'S UNIT HYDROGRAPH PARAMETERS ORIGINALLY DERIVED FOR THIS BASIN WERE USED.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS
Box 280
Beaver, Pa. 15009

Subject FULLER'S LAKE DAM — S.O. No.
100-YEAR DISCHARGE — Sheet No. 8 of 19
CALCULATION (CONT.) — Drawing No.
Computed by GWT — Checked by WDL — Date 1-5-80

THE 100-YEAR HYDROGRAPH IS THEREFORE COMPUTED USING THE SCS DIMENSIONLESS UNIT HYDROGRAPH APPROACH. TIME OF CONCENTRATION AND LAG TIME ARE COMPUTED AS FOLLOWS:

T_c = TIME OF CONCENTRATION = OVERLAND FLOW TIME + CHANNEL FLOW TIME

OVERLAND FLOW TIME

DISTANCE = 1700 FT.

SLOPE = $\frac{1785-1720}{1700}$ = 3.8 %

AVERAGE FLOW VELOCITY = 0.48 FT/SEC.
(FROM FIG. 3.1, T.R. No. 55, URBAN HYDROLOGY FOR SMALL WATERSHEDS, SCS)

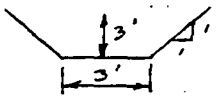
TRAVEL TIME = 3,541 SEC.

CHANNEL FLOW TIME

DISTANCE = 5050 FT.

SLOPE = $\frac{1720-1537}{5050}$ = 3.6 %

ASSUME AVERAGE CHANNEL SIZE IS:



$n = 0.045$

AVERAGE FLOW VELOCITY = $V = \frac{1.49}{n} R^{2/3} S^{1/2}$

$V = \frac{1.49}{0.45} \left(\frac{(3+3)3}{3+6\sqrt{1+9}}\right)^{2/3} (0.036)^{1/2}$

$V = 3.72$ FT/SEC.

TRAVEL TIME = 1357 SEC.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject FULLER'S LAKE DAM S.O. No.
100-YEAR DISCHARGE Sheet No. 9 of 19
CALCULATION (CONT.) Drawing No.
Computed by GWT Checked by WDL Date 1-5-80

TOTAL TRAVEL TIME = T_c = 3,541 + 1,357 = 4,898 SEC.
= 1.36 HR.

LAG TIME = 0.6 T_c = 0.82 HR.

WITH THE SCS PROCEDURE, A CURVE NUMBER OF 70 PRODUCED A PEAK FLOW OF 1076 CFS THIS VALUE IS WITHIN 2% OF THE PREVIOUSLY COMPUTED PEAK FLOW OF 1050.5 C.F.S. AND IS WITHIN THE 10% LIMIT SUGGESTED BY THE CORPS GUIDELINES.

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
 LAST MODIFICATION  26 FEB 79
 ADJ UPDATE         04 JUN 79
**********
```

BEAVER DAM IN PLACE

100 YEAR STORM ROUTING

```
    1          A1       NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
    2          A2       HYDROLOGIC AND HYDRAULIC ANALYSIS OF FULLERS LAKE DAM
    3          A3       UNIT HYDROGRAPH BY SCS METHOD
    4          B    433         3        10         0         0         0         0         0        -4         0
    5          B1     5
    6          J      1         1         1
    7          J1     1
    8          K      3         1                                                  1
    9          K1       RUNOFF HYDROGRAPH TO DAM
   10          M      3         2     0.95
   11          O     43      6.2
   12          O1 0.005     0.005     0.005     0.006     0.006     0.006     0.006     0.006     0.006     0.006
   13          O1 0.006     0.006     0.006     0.006     0.006     0.006     0.006     0.006     0.012     0.012
   14          O1 0.012     0.012     0.012     0.012     0.012     0.024     0.024     0.024     0.024     0.024
   15          O1 0.037     0.031     0.323     0.057     0.025     0.024     0.024     0.012     0.012     0.012
   16          O1 0.012     0.006     0.006     0.006     0.006     0.006     0.006     0.006
   17          T                                                                  -1       -70
   18          W2           0.12
   19          X    -1.5    -0.35      2.0
   20          K      1         2                                                  1
   21          K1       ROUTING FOR FULLERS LAKE DAM
   22          Y                                        1         1
   23          Y1     1                                                  -1538.5         0
   24          $A  13.33     16.33     25.71     38.57
   25          $I   1533      1537      1540      1550
   26          $S1538.2       2.2       2.9       1.5
   27          $D1539.6      3.33       1.5        99
   28          $L     3        13        29        45        54        71        84        97
   29          $V1539.2      1590    1540.5      1541    1541.5      1542    1542.5      1543
   30          K     77
```

SHEET 10 OF 19

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
HBJ UPDATE 04 JUN 79
****

RUN DATE 02/16/81
TIME 15.11

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
HYDROLOGIC AND HYDRAULIC ANALYSIS OF FULLERS LAKE DAM
UNIT HYDROGRAPH BY SCS METHOD

JOB SPECIFICATION

NJ	NSR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
400	0	10	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

RUNOFF HYDROGRAPH TO DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYD	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	2	0.95	0.0	0.95	0.0	0.0	0	0	0

LOSS DATA

LRUPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	0.0	1.00	0.0	0.0	1.00	-1.00	-70.00	0.0	0.0

CURVE NO = -70.00 WETNESS = -1.00 EFFECT CN = 70.00

UNIT HYDROGRAPH DATA
TC= 0.0 LAG= 0.82

RECESSION DATA
STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									304	0.20	2.96	3.29	11.96
									1	157.00	75.00	82.00	586.00

SHEET 11 of 19

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTED FOR FULLERS LAKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

JSKK	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	-1537.	0

SURFACE AREA=	14.	17.	26.	39.
CAPACITY=	0.	61.	124.	762.
ELEVATION=	1533.	1537.	1543.	1560.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1538.5	50.0	2.9	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1539.6	3.1	1.5	99.

CREST LENGTH	1.	13.	29.	45.	54.	71.	84.	97.
AT OR BELOW ELEVATION	1539.0	1540.0	1540.5	1541.0	1541.5	1542.0	1542.5	1543.0

PEAK OUTFLOW IS 692. AT TIME 6.83 HOURS

********** ********** ********** ********** **********

Supp 12 of 19

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00
HYDROGRAPH AT	1	1.95 (2.46)	1	1076. (30.48)
ROUTED TO	2	1.95 (2.46)	1	692. (19.60)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 BEAVER DAM IN PLACE

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1538.50	1539.50	1539.50
STORAGE	89.	89.	114.
OUTFLOW	0.	0.	187.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1540.91	1.31	147.	692.	3.33	6.83	0.0

100-YEAR FLOOD ROUTING

41 OF 41 SHEETS

BEAVER DAM REMOVED

100-YEAR FLOOD ROUTING

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION       JULY 1973
  LAST MODIFICATION   26 FEB 79
  MBJ UPDATE          04 JUL 79
**********************************
   1        A1    NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
   2        A2    HYDROLOGIC AND HYDRAULIC ANALYSIS OF FULLERS LAKE DAM
   3        A3    UNIT HYDROGRAPH BY SCS METHOD
   4        B     400      0      10       0       0       0       0       0      -4       0
   5        B1      5
   6        J       1      1       1
   7        J1      1
   8        K       0      1                                      1
   9        K1    RUNOFF HYDROGRAPH TO DAM
  10        M       0      2    0.95
  11        O      43    6.2
  12        O1  0.005  0.005   0.006   0.006   0.006   0.006   0.006   0.006   0.005   0.006
  13        O1  0.005  0.005   0.006   0.006   0.006   0.006   0.006   0.012   0.012   0.012
  14        O1  0.012  0.012   0.012   0.012   0.012   0.024   0.024   0.024   0.024   0.025
  15        O1  0.057  0.081   0.323   0.057   0.025   0.024   0.024   0.012   0.012   0.012
  16        O1  0.012  0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17        T                                                    -1     -70
  18        W2          0.32
  19        X    -1.5  -0.05     2.0
  20        K       1      2                                      1
  21        K1    ROUTING FOR FULLERS LAKE DAM
  22        Y                              1       1
  23        Y1      1                                        -1537.0      -1
  24        Y4   1537 1537.7  1538.3    1539  1539.6  1540.2  1540.3
  25        Y5      0   29.4   100.3   224.7   370.8   635.9   674.1
  26        $A  13.33  16.52   23.71   38.57
  27        $E   1533   1537    1540    1560
  28        $$   1537
  29        $D1539.6  3.03     1.5      39
  30        $L      0     15      29      45      54      71      84      97
  31        $V1539.5   1540  1540.5    1541  1541.5    1542  1542.5    1543
  32        K      99
```

```
*************************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION        JULY 1978
  LAST MODIFICATION  26 FEB 79
  MBJ UPDATE          04 JUL 79
*************************************

RUN  DATE 02/16/81
     TIME    10.04

              NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
              HYDROLOGIC AND HYDRAULIC ANALYSIS OF FULLERS LAKE DAM
              UNIT HYDROGRAPH BY SCS METHOD

                              JOB SPECIFICATION
      NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
     400       0      10       0       0       0       0       0       4       0
                          JOPER     NWT   LROPT   TRACE
                              5       0       0       0       0

                        MULTI-PLAN ANALYSES TO BE PERFORMED
                          NPLAN= 1 NRTIO= 1 LRTIO= 1

              RTIOS=   1.00

  **********     **********     **********     **********     **********

                         SUB-AREA RUNOFF COMPUTATION

            RUNOFF HYDROGRAPH TO DAM

                ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                    1       0       0       0       0       0       1       0

                                 HYDROGRAPH DATA
         IHYDG   IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
             0      2    0.95     0.0    0.95     0.0     0.0       0       0       0

                                    LOSS DATA
     LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
         0     0.0     0.0    1.00     0.0     0.0    1.00   -1.00  -70.00     0.0     0.0

       CURVE NO = -70.00   WETNESS =   -1.00   EFFECT CN =   70.00

                              UNIT HYDROGRAPH DATA
                          TC=  0.0       LAG=  0.82

                                 RECESSION DATA
                   STRTQ=   -1.50    QRCSN=   -0.05    RTIOR=  2.00

                                END-OF-PERIOD FLOW
     0
 MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q     MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q

                                                                       SUM   6.20   2.96   3.24   11324.
                                                                           (157.)( 75.)( 82.)( 320.66)
```

Sheet 16 of 18

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTING FOR FULLERS LAKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

JLOSS	LOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

ISTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	-1537.	-1

STAGE	1537.00	1537.70	1538.30	1539.00	1539.60	1540.20	1540.30
FLOW	0.0	29.60	100.30	224.70	370.80	635.80	674.10
SURFACE AREA=	14.	17.	26.	39.			
CAPACITY=	0.	61.	124.	762.			
ELEVATION=	1533.	1537.	1540.	1560.			

CELL	SPMID	COQM	EXPM	ELEVL	COWL	LAREA	EXPL
1537.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1539.6	3.1	1.5	99.

CREST LENGTH AT OR BELOW ELEVATION	0. 1539.0	16. 1540.0	29. 1540.5	45. 1541.0	54. 1541.5	71. 1542.0	84. 1542.5	97. 1543.0

PEAK OUTFLOW IS 631. AT TIME 7.00 HOURS

********** ********** ********** ********** **********

SHEET 17 OF 18

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS
				1.00
HYDROGRAPH AT	1	.92	1	1076.
		(2.46)		(30.48)(
ROUTED TO	2	.92	1	631.
		(2.46)		(17.87)(

SHEET 18 OF 19

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 BEAVER DAM REMOVED

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1537.00	1537.00	1539.00
STORAGE	61.	61.	229.
OUTFLOW	0.	0.	571.

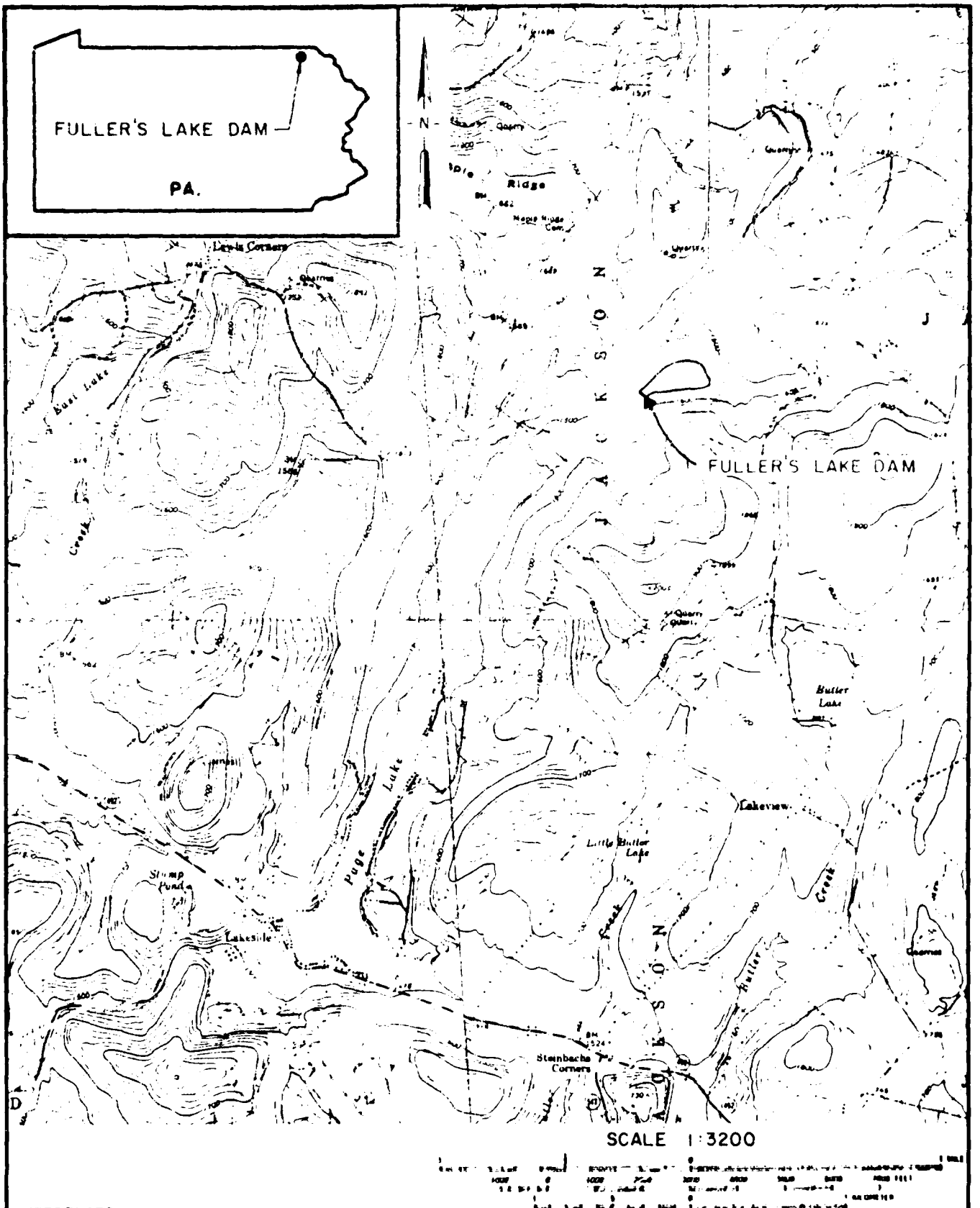
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1542.16	0.56	128.	631.	1.67	7.00	0.0

100-YEAR FLOOD ROUTING

APPENDIX E

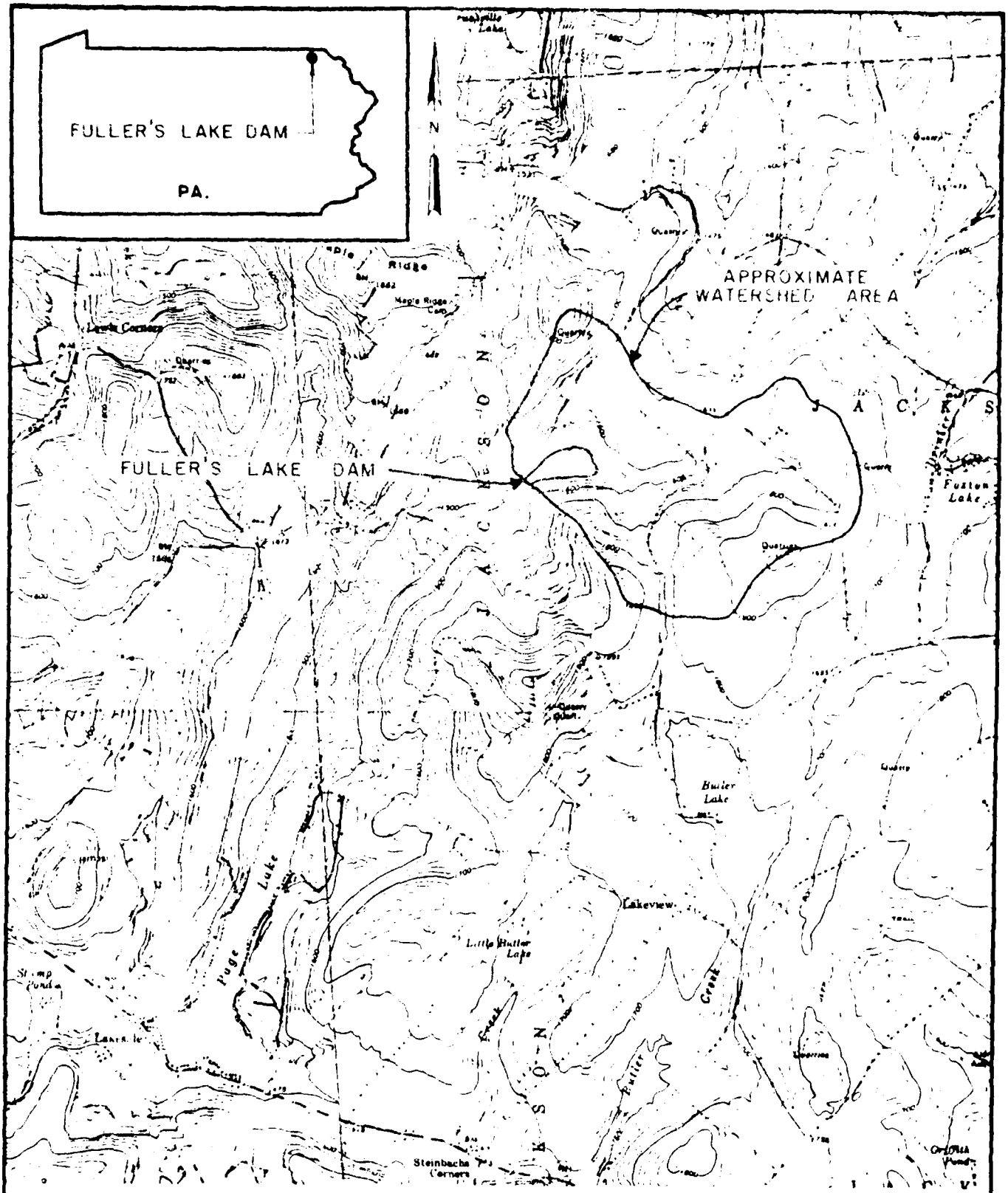
PLATES

CONTENTS



REFERENCES:
1. U.S.G.S. 7.5' GREAT BEND, PA QUADRANGLE PHOTOREVISED 1978
2. U.S.G.S. 7.5' HARFORD, PA QUADRANGLE PHOTOREVISED 1978
3. U.S.G.S. 7.5' SUSQUEHANNA, PA QUADRANGLE 1968
4. U.S.G.S. 7.5' THOMPSON, PA. QUADRANGLE PHOTOREVISED 1978

PLATE 1 LOCATION PLAN
FULLER'S LAKE DAM



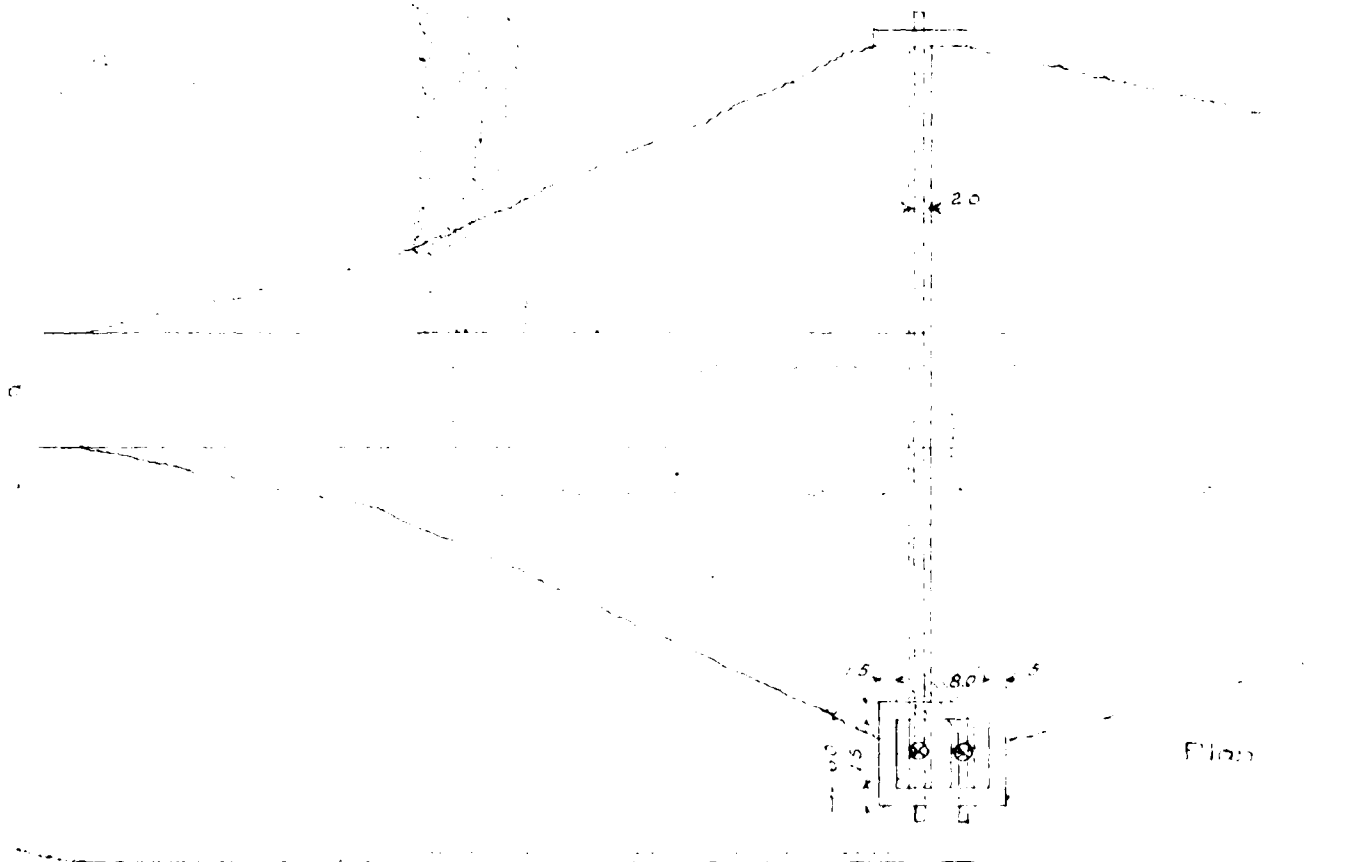
REFERENCES:

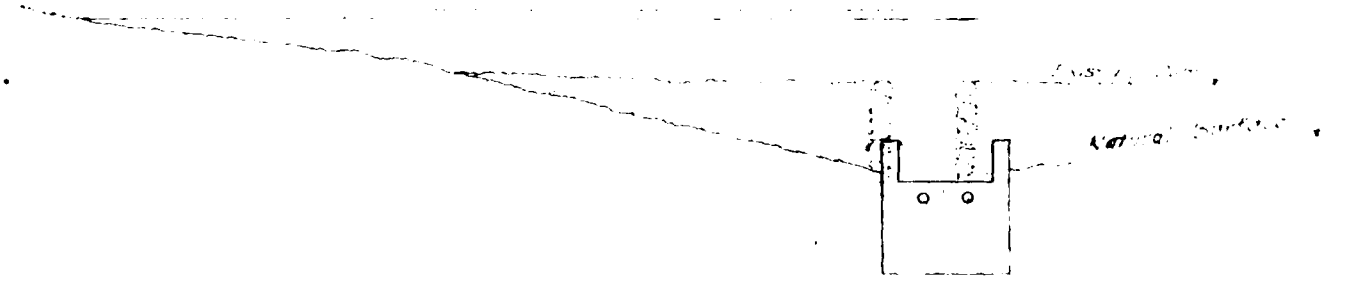
1. U.S.G.S. 7.5' GREAT BEND, PA. QUADRANGLE PHOTOREVISED 1978
2. U.S.G.S. 7.5' HARFORD, PA. QUADRANGLE PHOTOREVISED 1978
3. U.S.G.S. 7.5' SUSQUEHANNA, PA. QUADRANGLE 1968
4. U.S.G.S. 7.5' THOMPSON, PA. QUADRANGLE PHOTOREVISED 1978

PLATE 2 WATERSHED MAP

FULLER'S LAKE DAM

Transverse Section
at
Discharge Pipe





Front Elevation

PLANS
OF
DAM ON MAD RUN
FOR
FREDERICK D. HOAL
SUSQUEHANNA, PA.
Scale 1"=10' July 8, 1953
W. E. Lance, Reg Prof. Eng. 4476
Trucksville, Pa.

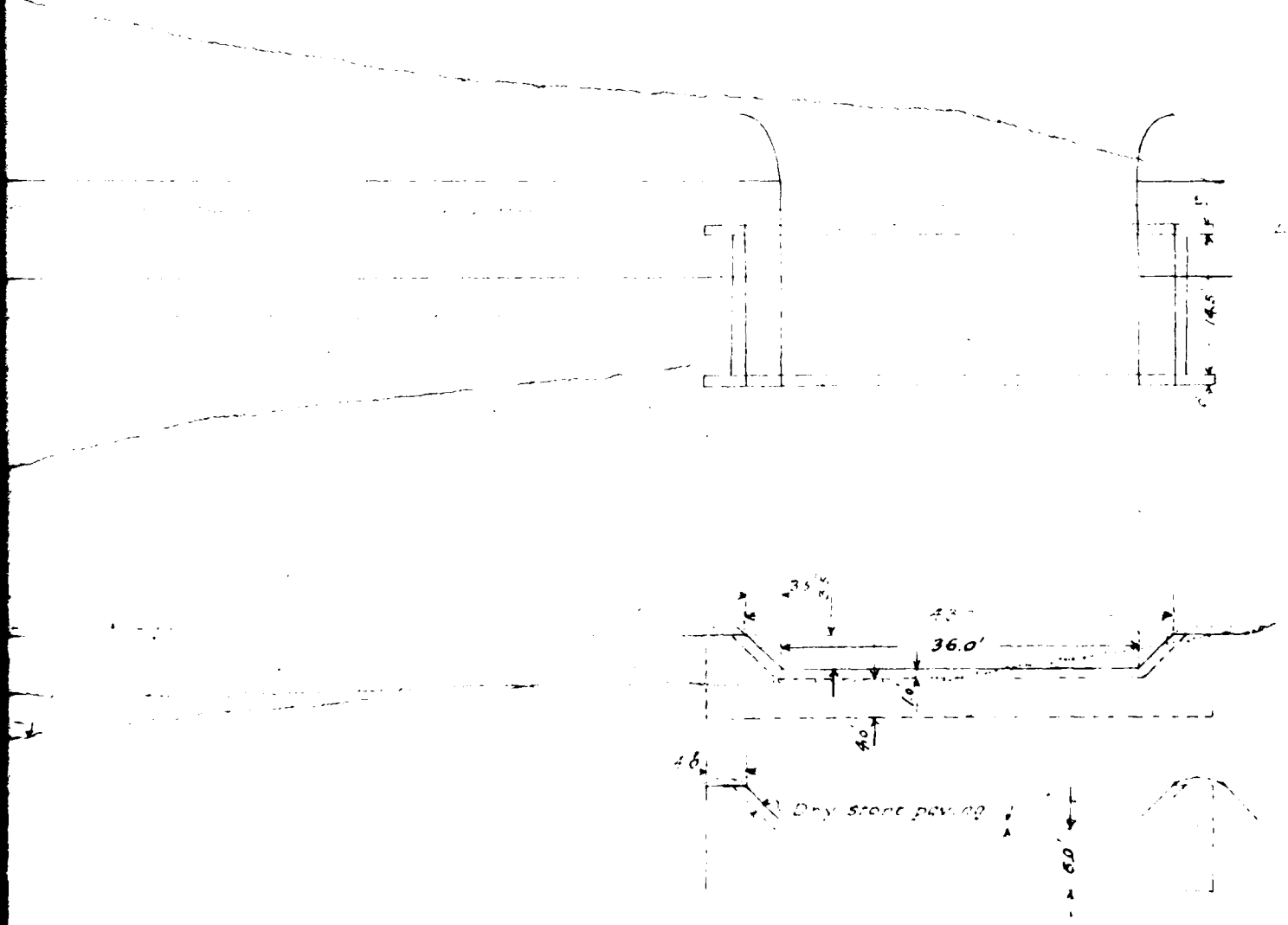
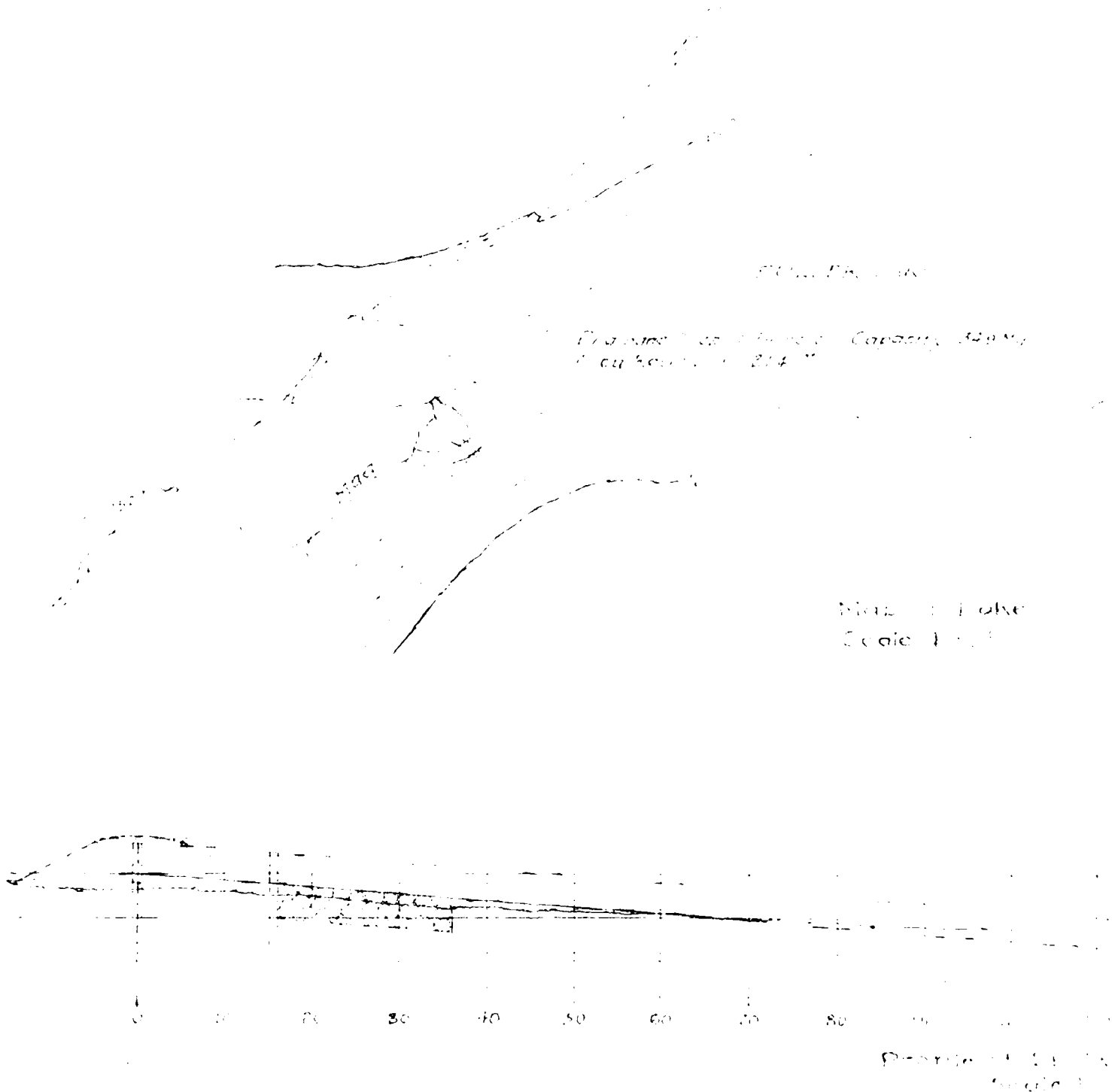
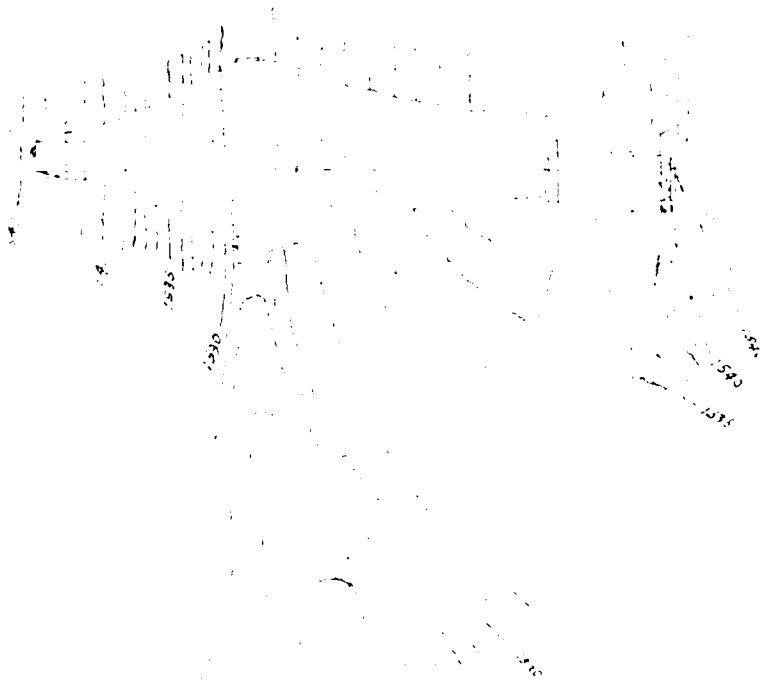


PLATE - 3

Bottom of Spillway

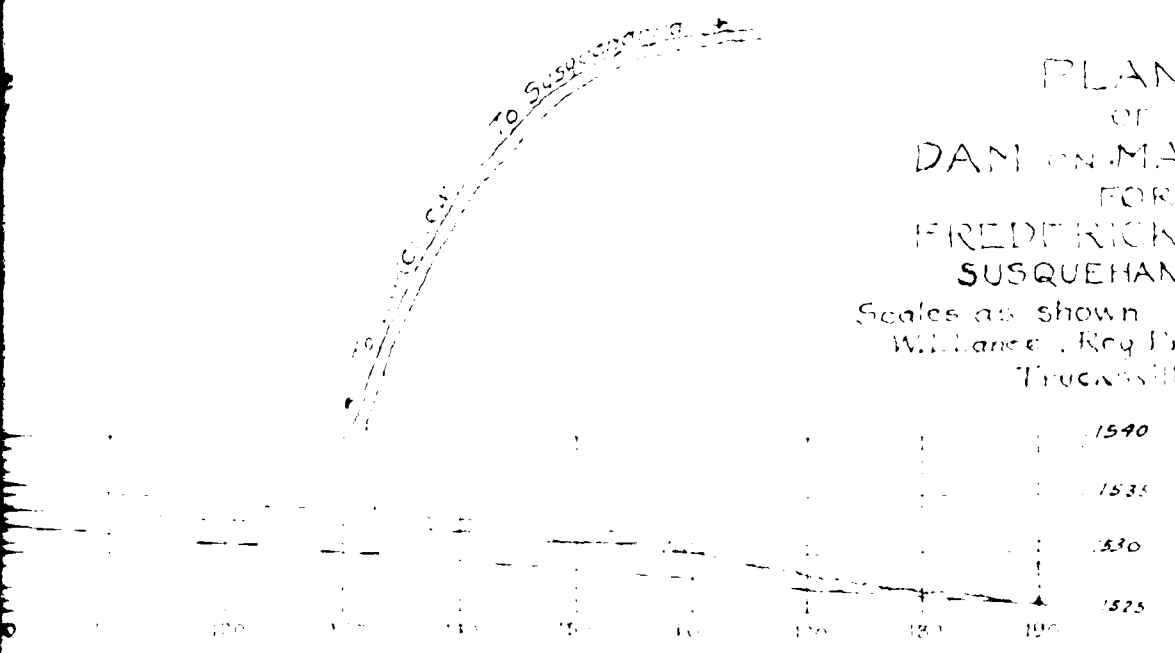




Plan of Dam
Scale 1" = 40'

PLANS
OF
DAM ON MAD RUN
FOR
FREDERICK D. HOAL
SUSQUEHANNA, PA.

Scales as shown Sept. 10, 1953
W. L. Lance, Reg. Prof. Eng. 4470
Trucksville, Pa.



St... Channel
ale 1" = 10'

PLATE - 4

No. ... Sheets

12

APPENDIX F

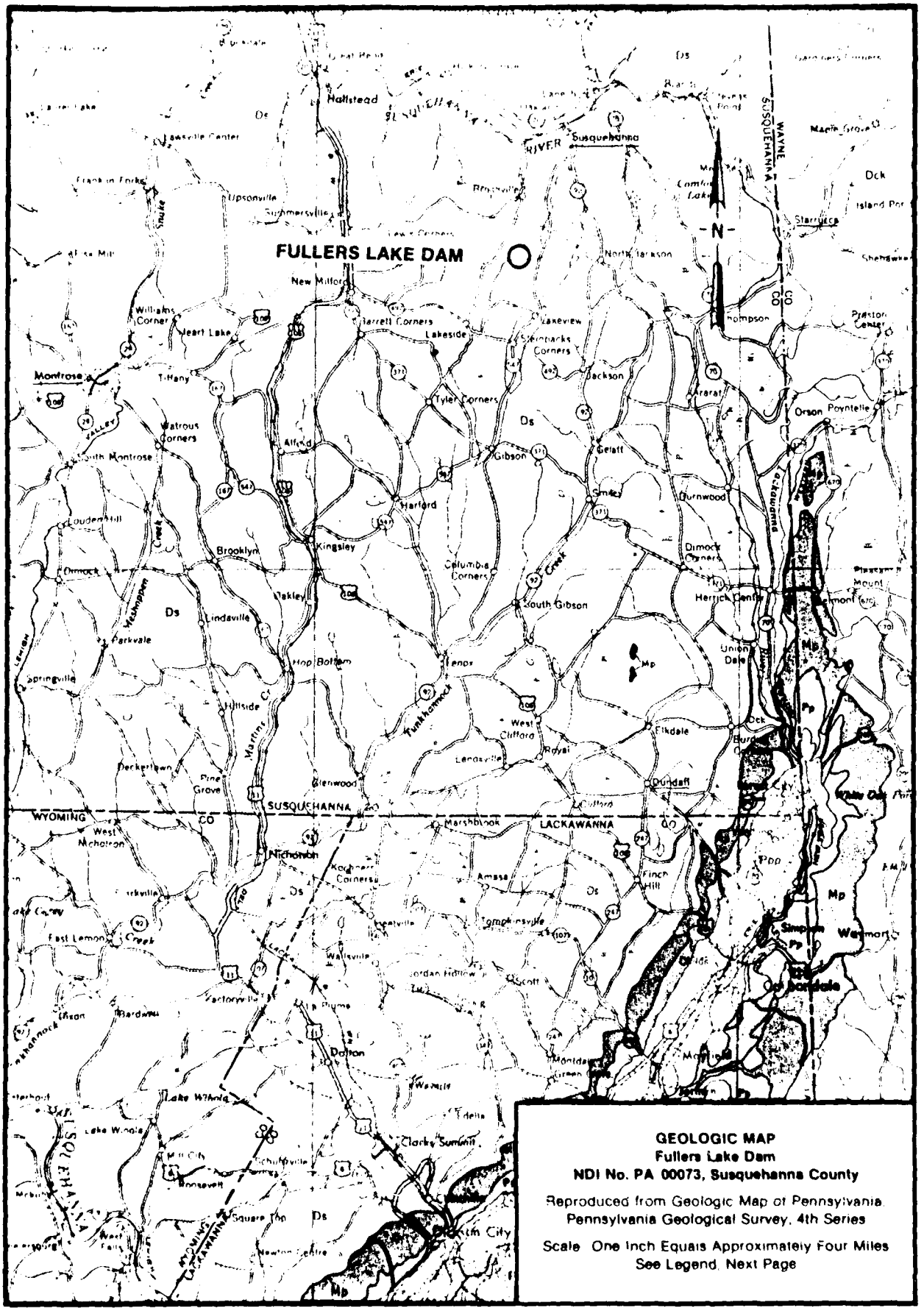
REGIONAL GEOLOGY

FULLER'S LAKE DAM
NDI No. PA 00073, PennDER No. 58-121

REGIONAL GEOLOGY

Fuller's Lake Dam is situated in the Glaciated Low Plateaus physiographic province. The area has undergone at least three stages of glaciation and is presently covered with Wisconsin Stage glacial deposits. According to the Soil Conservation Service's Soil Survey for Susquehanna County, the surface soils consist primarily of stoney, silt loams of the Morris-Wellsboro-Volusia association. No test boring data were available for review on this project, thus, the thickness of this overburden could not be ascertained.

Geologic references indicate that the bedrock in the vicinity of the dam consists primarily of members of the Catskill Formation in the Susquehanna Group. These are chiefly red and gray shales and sandstones of Upper Devonian age. The formation may also contain scattered, thin streaks of coal and scattered fish remains. The strata in the area were deposited in a bay or delta front environment and remain essentially horizontal after the Appalachian Uplift.



GEOLOGIC MAP
Fullers Lake Dam
NDI No. PA 00073, Susquehanna County

Reproduced from Geologic Map of Pennsylvania, Pennsylvania Geological Survey, 4th Series

Scale One Inch Equals Approximately Four Miles
See Legend, Next Page

GEOLOGY MAP LEGEND

DEVONIAN

UPPER

WESTERN PENNSYLVANIA

Dow Dr — **Oswayo Formation**
Greenish gray to gray shales, siltstones and sandstones becoming increasingly shaly westward, considered equivalent to type Oswayo. Riceville Formation Dr in Erie and Crawford Counties, probably not distinguishable north of Corry.

Dcr — **Cattaraugus Formation**
Red, gray and brown shale and sandstone with the proportion of red decreasing westward. Includes Venango sands of drillers and Salamanca sandstone and conglomerate, some limestone in Crawford and Erie counties.

Dct — **Conneaut Group**
Alternating gray, brown, greenish and purplish shales and siltstones, includes "pink rock" of drillers and "Chemung" and "Girard" Formations of northwestern Pennsylvania.

Dca — **Canadaway Formation**
Alternating brown shales and sandstones, includes "Portage" Formation of northwestern Pennsylvania.

CENTRAL AND EASTERN PENNSYLVANIA

Dow — **Oswayo Formation**
Brownish and greenish gray, fine and medium grained sandstones with some shales and scattered calcareous lenses, includes red shales which become more numerous eastward. Relation to type Oswayo not proved.

Dck — **Catskill Formation**
Chiefly red to brownish shales and sandstones, includes gray and greenish sandstone tongues named Elk Mountain, Honesdale, Shohola, and Delaware River in the east.

Dm — **Marine beds**
Gray to olive brown shales, graywackes, and sandstones, contains "Chemung" beds and "Portage" beds including Burket, Brallier, Harrell, and Trimmers Rock, Tully Limestone at base.

Ds — **Susquehanna Group**
Barbed line in "Chemung Catskill" contact of Second Pennsylvania Survey County reports barbs on "Chemung" side of line.

MIDDLE AND LOWER

Dhc — **Hamilton Group**

Dh — **Mahantango Formation**
Brown to olive shale with interbedded sandstones which are dominant in places (Montebello), highly fossiliferous in upper part, contains "Centerfield coral bed" in eastern Pennsylvania.

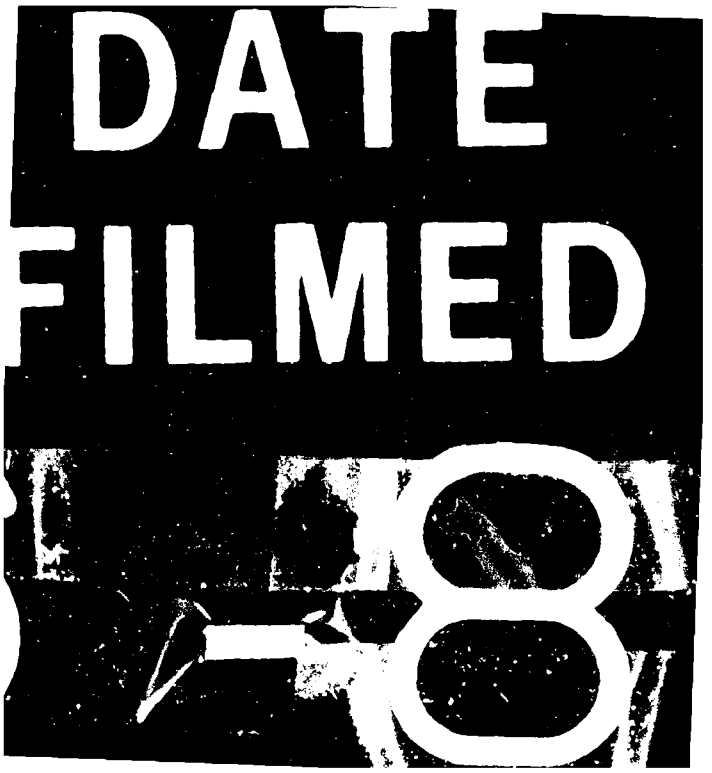
Marcellus Formation
Black, fissile, carbonaceous shale with thick, brown sandstone (Turkey Ridge) in parts of central Pennsylvania.

Onondaga Formation
Greenish blue, thin bedded shale and dark blue to black, medium bedded limestone with shale predominant in most places, includes Selinsgrove Limestone and Needmore Shale in central Pennsylvania and Huttermilk Falls Limestone and Esopus Shale in easternmost Pennsylvania, in Lehigh Gap area includes Palmerton Sandstone and Bowmanstown Chert.

Dmc — **Onondaga Formation**
Greenish blue, thin bedded shale and dark blue to black, medium bedded limestone with shale predominant in most places, includes Selinsgrove Limestone and Needmore Shale in central Pennsylvania and Huttermilk Falls Limestone and Esopus Shale in easternmost Pennsylvania, in Lehigh Gap area includes Palmerton Sandstone and Bowmanstown Chert.

Do — **Oriskany Formation**
White to brown, fine to coarse grained, mostly calcareous, locally conglomeratic, fossiliferous sandstone (Ridgely) at the top, dark gray, cherty limestone with some interbedded shales and sandstones below (Shriver).

Dhb — **Helderberg Formation**
Dark gray, calcareous, thin bedded shale (Mandata) at the top, equivalent to Port Ewen Shale and Bucraft Limestone in the east, dark gray, cherty, thin bedded, fossiliferous limestone (New Scotland) with some local sandstones in the middle, and, at the base, dark gray, medium to thick bedded, crystalline limestone (Coeymans), sandy and shaly in places with some chert nodules.


DATE
FILMED
-8